DECEMBER 1961

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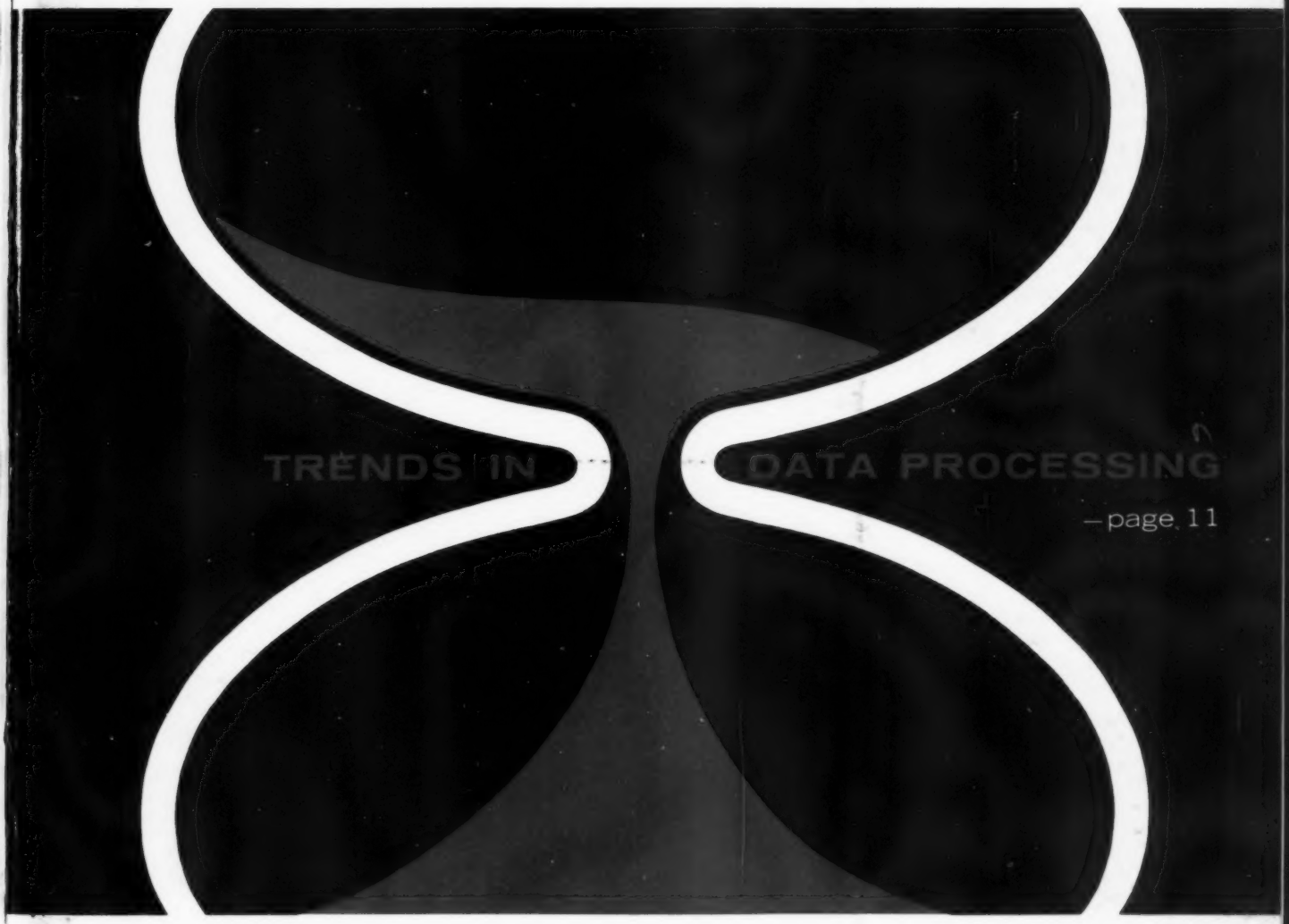

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OBSERVATIONS . . .
from the publisher

NEW PUBLICATIONS

DATA PROCESSING EQUIPMENT ENCYCLOPEDIA, after a year of concerted editorial activity, has emerged as the only authoritative reference on all phases of data processing hardware — from edge punched and plate embossing devices through all varieties of punched card and electronic computer and related equipment.

Within a week after release of the Encyclopedia one of the nation's leading accounting firms announced that they would discontinue their own research activities and install a set of Encyclopedia in each of their 34 branch offices instead. A Japanese organization has also installed 25 sets.

Close on the heels of the publication of this hardware reference, we are now pleased to announce the editorial completion of two significant software references.

1. **Data Processing WIRING GUIDE**
   Wired Programming for Punched Card Equipment.
2. **COMPUTER APPLICATIONS Handbook**
   Case Studies of Business Uses of Electronic Computers.

These two research achievements are in the final stages of production and scheduled for early release. Both are permanent cloth bound volumes in the style of the Equipment Encyclopedia. They further complete the library of software already served by our looseleaf punched card applications handbooks.

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AUTHORS

WILLIAM L. HOOKER *(Control Standards for Punched Card Equipment)* is with the supervisory control standards section of United Aircraft Corporation—Pratt & Whitney division. From 1944 until 1948 he was associated with the Bush Manufacturing Company, as supervisor of methods and labor standards. His previous experience includes being engaged as a public accountant in a CPA office. He is a member of the National Machine Accountants Association.

ROBERT W. PARSONS *(Installation Management by Exception)* is installation manager for Mele Manufacturing Company, Inc. of Utica, N. Y. The past and future growth of the firm into expanded lines of merchandising, from jewel boxes to key cases, electric shaver boxes, and other products, has created a need for faster and better machine data processing. Mr. Parsons, who has been in data processing since 1953, previously held the position of installation manager for Central Markets, Schenectady, N. Y.

JOHN A. POSTLEY *(Current Trends in Business Data Processing)* is Director of Information Services at Advanced Information Systems Company, Los Angeles. He has a B.A. in mathematics from the University of California-L.A., and has undertaken extensive graduate work there in the fields of accounting, finance, philosophy, formal logic, and mathematics.

Beginning his career in 1948 at the Institute of Numerical Analysis of the National Bureau of Standards as assistant supervisor of computing, he subsequently became head of the computing department for Northrop Corporation, Hughes Aircraft, and RAND Corporation, respectively. In 1960 he helped form the Advanced Information Systems Company.

In January, 1960, McGraw-Hill published his *Computers and People*, the first book to explore the relationship between information systems and the people they serve.

Mr. Postley is chairman of the Special Interest Group on Business Data Processing of ACM, associate editor of *Computing Reviews*, honorary ACM Lecturer for 1961-62, a member of The American Society for Public Administration, and a member of the teaching staff in the extension division of UCLA.

DARYL D. WHITE *(Predated Checks)* is employed by FIF Management Corporation, principal underwriter for Financial Industrial Fund, Inc. and Financial Industrial Income Fund. The data processing department plays a leading role in providing investors in both Funds the assurance of immediate up-to-date investment account information. All individual records are maintained through the use of IBM data processing equipment with the main unit a 305 RAMAC Tape System. ■

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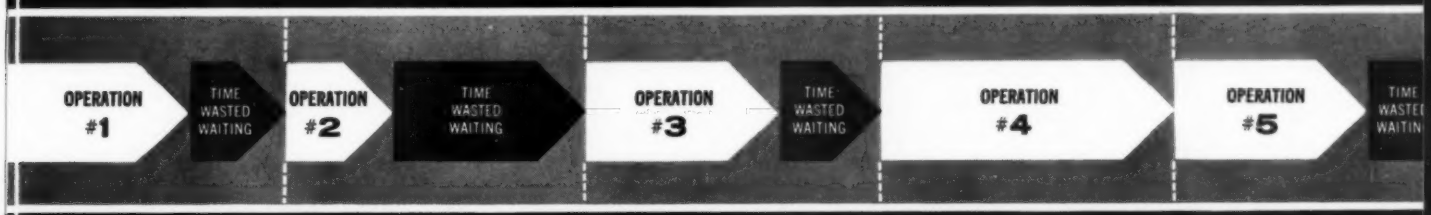

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COMMENTS

Dear Sirs:

Congratulations on your excellent editorial in the August 1961 issue of *Data Processing*. Your efforts to stimulate interest in science education are greatly appreciated by those concerned with promoting scientific investigations by students. Here in San Diego, the outstanding climate of industry-education cooperation has provided quite generously both manpower and material resources for many facets of our school science program. Individual counseling of students with scientists, engineers and technical people along with the supplying of surplus materials has been very effective in increasing the number of student science projects in our secondary schools.

We hope that your message will stimulate even more good school-community relations in San Diego and everywhere throughout the nation.

S. L. Giuliani
Assistant Supervisor
Secondary Mathematics and Science
San Diego City Schools

Port-a-punching

White Plains, New York

Dear Sirs:

I enjoyed very much Mr. Roger T. Biringer's article, "Port-A-Punching for Data Processing," which appeared in your September, 1961 issue. We are always pleased to know that others find our products and services suitable for many applications.

W. L. Ellis
Manager, Supplies Marketing
IBM Data Processing Division

Fire safety for computers

Boston, Massachusetts

Dear Sirs:

Thank you very much for sending us the copy of your September issue with the article on our electronic computer standard.

This is of tremendous assistance in posting people in the industry on the development of such a guide.

Deuel Richardson, Manager
Public Relations Department
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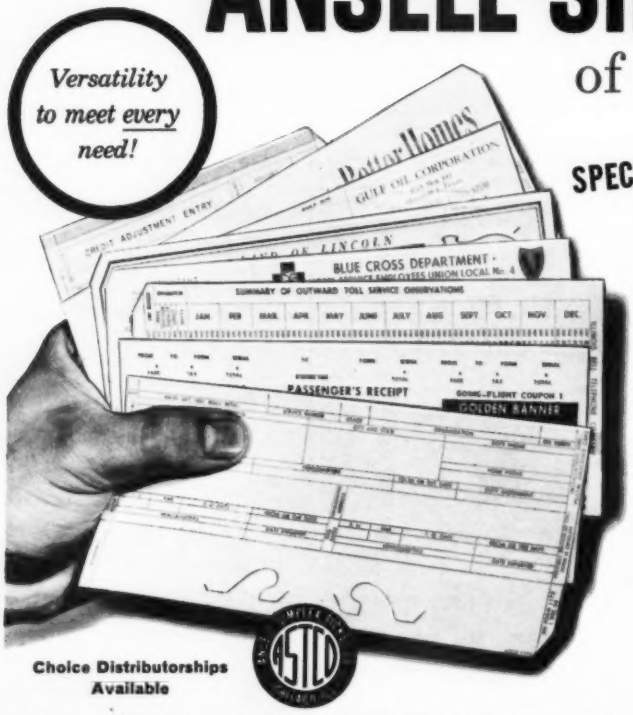

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IF

- *you're weary of matching one assembler instruction per one machine language instruction*
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- *you're using up time and money with hunt-and-peck machine language debugging and reprogramming*
- *you're tired of seeking, teaching or even becoming a bilingual programmer—fluent in both problem and machine languages*
- *you're fed up with programming methods that are cumbersome, time-consuming and costly*

Then, you'll be interested in Burroughs B 5000, a new kind of information processing system which is the result of a total departure from traditional computer design concepts. A system in which *software* dictates equipment designs and specifications to bridge the communication gap between man and machine.

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The system language is designed to implement the problem language for extremely rapid translations allowing program translation each run. Object programs, as efficient as those written in machine language, can be created far faster than with the most advanced conventional computers.

The need for the programmer to know both problem and machine languages is eliminated. Now for the first time, the programmer is free to concentrate on the processing problem itself. Free of the gymnastics he used to employ to make his problem acceptable to the machine, he merely states the problem and the Burroughs B 5000 provides an efficient, rapid solution. Burroughs—TM

Burroughs Corporation, Detroit 32, Michigan

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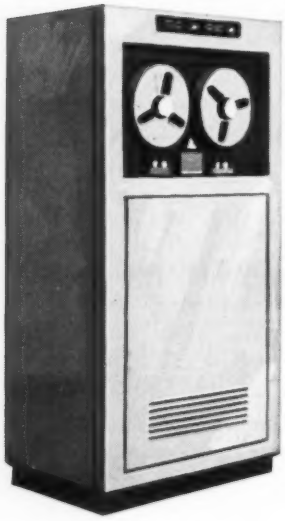
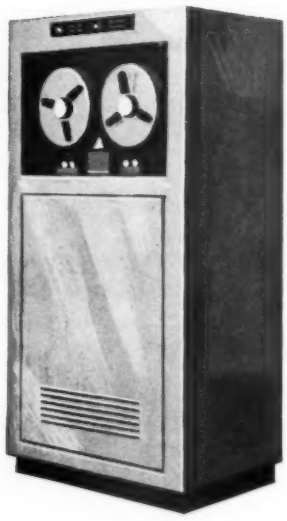
Now business machines can "talk" over telephone lines





DATA-PHONE service makes it possible. It's the new Bell System development that lets you send business data over regular telephone lines, at regular telephone rates. DATA-PHONE service converts either card-punched or taped data into a special language which can be sent by telephone at speeds up to 1600 words per minute. It speeds data collections from branches, improves customer service, promotes more efficient, more profitable operations. *Like to know more?* Just call your Bell Telephone Business Office and ask for a Communications Consultant. He'll bring you complete details. No obligation, of course.

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NEWS SUMMARY

Four leading Russian technical journals for 1961 are translated and being published by ISA under a grant in aid from National Science Foundation.

GENERAL

Using Autonetics Recomp II computer, Pacific Optical Corporation has been able to advance optical design considerably.

Bell Telephone Laboratories report a new form of crystal of silicon, so thin they are semi-transparent ribbons; these may have important implications for semiconductor devices.

C-E-I-R, Inc., has opened a new analytical services and data processing office in Dallas, which will use their Houston installation of 7090/1401 combination.

FINANCIAL

IBM reports first nine months' net earnings were $152,887,977; $5.55 a share. This is up close to 35 million over 1960, and up from $4.34 a share

Data Processing Services of Alexandria, Virginia reported total sales of $100 thousand since May 1, 1961.

Bell & Howell Company third quarter sales and earnings are highest in their history, up over records of 1960.

Standard Register third quarter volume and earnings about same as 1960; net income $2,048,212, $1.93 a share.

Electronics Associates, Inc. totalled $669,000 after taxes for first nine months of 1961, a 4.5 percent increase over corresponding 1960 period.

ITT's report shows an increased nine months' earnings of $23,930,259 ($1.48 a share), with the third quarter net income up almost half a million dollars (47 cents a share).

Litton Industries' final report for 1960-61 fiscal year shows after tax earnings to be $10,158,323, about 36 percent increase over the previous year. Per share earnings were $2.30.

NCR's first three-quarters for 1961 were up 15 percent over 1960 periods; net income was up 10 percent (after taxes) to $13,428,864, or $1.69 a share.

USERS

Glens Falls Insurance Company has installed an IBM 1401 to handle statistical and financial data in its home office; this replaces their previously used 650.

Mallinckrodt Chemical Works has installed an RCA 301 system at its St. Louis headquarters, initially for general accounting and sales analysis, later for scientific operations, inventory control and production scheduling.

Honeywell's twenty fifth 800 went to Philadelphia Electric Company to be used for billing, engineering, and general accounting.

Chase Manhattan has accepted delivery of a Cummins ODP Sorter.

Menasco Manufacturing Company, aircraft landing gear maker, will control financial and production requirements with their new RCA 301 system.

(continued on next page)

ORDERED

Houston Lighting & Power Company will get a Univac III early in 1963.

Trans World Airlines has ordered the airline industry's first intercontinental reservations system from Teleregister. This $6.5 million Teleflite system is scheduled for operation in slightly over a year.

First Camden National Bank & Trust Company is awaiting additional ODP equipment from Cummins-Chicago.

Australia's Department of Defense will install two Honeywell 800s at its EDP Proving and Training Center at Canberra sometime during mid-1962.

MILITARY

The Naval Propellant Plant in Maryland is using an RCA 501 computer and Interstate Electronics data gathering unit to produce more efficient solid rocket fuels.

The Department of Defense has ordered an S-C 4020 Computer Microfilm Recorder from General Dynamics/Electronics. The unit will translate coded information from an IBM 7070 into graphs, curves and alphanumeric recording on 35 mm microfilm.

The Air Force Office of Scientific Research (AFSOR) has awarded two million dollars in basic research grants and contracts since September. The most recent awards went to 43 universities, colleges, non-profit research institutions and industrial laboratories in the U.S. and two Canadian universities. Total awards so far this fiscal year have been 79 basic research grants valued close to three million dollars.

EDUCATIONAL

Datex Corporation employees are going to school to increase their knowledge in their work, keep up with new developments, and increase chances for promotion. Almost all the courses are college-level. The corporation's tuition refund program pays one-half the cost where tuition is charged or one-half the cost of books at schools where the employee-student does not pay tuition.

FOREIGN

Radio Corporation of America and International Computers and Tabulators Limited of England have signed two multi-million dollar agreements. One contract is for the sale of electronic data processing systems, for which ICT has placed an initial order of 50 RCA data processing systems with an option to purchase an additional 50 systems. The second agreement is for the mutual exchange of patent licenses for the equipment.

This is the second such agreement within a month that RCA has signed, the first was with Compagnie des Machines Bull of France. These contracts constitute the largest commercial sales of electronic data processing equipment ever made.

Elliott Brothers Limited (London) has contracted with North American Aviation, Inc., to purchase six complete Verdan computers and six sets of component parts for assembly in England. Delivery of computers and components will begin in 1962 and will be completed by March, 1963.

Standard Register has added a new foreign associate, Formularios Standard of Central American of Guatemala.

Electronic Associates, Inc. has formed a subsidiary in Aachen, West Germany, to handle sales of its instrument line in that country.

COVER FEATURE

Current Trends in Business Data Processing

Business and scientific-engineering data processing similarities

THE LINE between business data processing and scientific and engineering computing today has become as sharp as a melted marshmallow. For every task which can be clearly classified as "business data processing" or "scientific computing," there are potentially tens or perhaps hundreds of tasks which contain the elements of both.

Upon what does this distinction really hinge? By making possible the rapid performance of arithmetic operations, computers have already permitted us to employ new methods involving extensive scientific and engineering calculations, totally impossible without them. Now as we begin to move into the sphere of data processing for business management, it is becoming evident that entirely new methods of business operations and management are also possible. These new business methods are based on the essentially non-arithmetic capabilities of computers. The notion of arithmetic or non-arithmetic processing represents one meaningful way to classify problems as to scientific and engineering or business data processing.

By John A. Postley

But while new triumphs in scientific computing have been derived from a sound base of mathematical theory and research, no such base exists in the business field. The principles of accounting and record keeping operations are reasonably well-defined for non-computer-oriented systems. But these principles must undergo substantial revisions when we consider the prospect of applying them to data processing equipment, a prospect totally unthinkable in the days when the principles were developed. When we add to this the fact that there exists no theory relating the many segments of business data processing systems to one another, and the further fact that management planning and operations research offer whole new vistas of application, it would seem clear that our approach to business data processing on a comprehensive basis must be to return to fundamentals. Thus, a second dimension in the classification of scientific or business data processing is the presence of well developed mathematical and engineering theory for scientific information systems and the almost com-

plete lack of a fundamental theory of business information systems.

A third point of view by which information systems can be classified as scientific or business data processing systems is that of the behavioral scientist. The behavior of people who operate and use the system in a computer-oriented environment looms as a major aspect of successful information systems for business, while it is usually a minor or non-existent factor in most systems for scientific use. These behavioral considerations involve psychological, sociological, and organizational factors which reflect the new role of the computer as an organizational element with which these people must interact.

If, then, we use the term "business data processing" not to refer to complete systems but to refer to particular aspects of systems which emphasize non-arithmetic processing, which lack a fundamental theory as a basis, and which involve an interaction among people and between computers and people (and not everyone need agree that only "business" data processing is contained in this definition), then vital work is underway at the present time in these basic business data processing aspects. To illustrate the kind of work now in progress, consider three current projects which seek to advance business data processing theory and application techniques on a broad base.

Generalized information retrieval: non-arithmetic processing

This effort described here has resulted in an operating information retrieval system designed to obtain data and to prepare reports from any variety and any number of magnetic tape files. The system is designed to solve the problem created when reports must be prepared from any of a group of related but non-standard magnetic tape files. In order to avoid the construction of a separate information retrieval and report generation routine for each such file, a single system to handle all requirements is necessary.

The system operates on magnetic tape files of any physical and logical character. The information for the reports is acquired by automatic retrieval of portions of records in these files which meet criteria specified by the requestor. Simultaneous preparation of reports in response to a large number of unrelated requests is the major feature of the system. Alternatively, reports reflecting information in any or all of the magnetic tape files in the system can be prepared upon request.

The requirements to accomplish these objectives are: a) a dictionary for each file, containing information related to the structure, format, content, and size of the records in that file; b) requests which specify criteria for selection of information from records and which specify the content and form of each report desired; and c) the generalized information retrieval and report preparation system.

The files on which the system operates can be completely incompatible as regards sort sequence, record format and length, file structure, etc. The dictionary contains three sections: the file section; the records section; and the symbol section. The file section contains information about the physical records on tape; the record section contains information about the logical records in the file; and the symbol section contains information about the data fields (symbols) in each record type.

The request form contains two kinds of information: the search criteria necessary to identify the records required, and the report specifications which describe the content and format of the desired printed report. Each search criterion specifies the name of a data field to be examined, a specific value, and a relationship of that data field to the value. Four levels of and/or logic supplement this relationship, with multiple criteria permitted at each level.

The report prepared by the system is completely specified by the requestor. A request may specify information from any data fields in the files, printed in columns across the report page in any order. The report sequence is completely flexible as is the ability to summarize specified data fields for major, intermediate, or minor totals. Any combination of printing or suppression of printing of report data is also available. Non-standard column headings may be specified by the requestor if he does not wish standard report column headings to be printed automatically.

In the operation of the generalized information retrieval system, the dictionary and the request specifications are read into the processor and are used by the program to compile a separate retrieval program for each request. The master file(s) to be searched is (are) read, one record at a time, and this program compares the search criteria of each request against the record. When the criteria of any request are satisfied, the program extracts the data fields required for preparing the report and writes them on a report tape. After the complete file has been examined in this fashion, the report tape is sorted to separate the several reports and to sequence each one as specified in the corresponding request. A report for each request is then prepared according to the remaining report specifications.

This system has been programmed in essentially similar form for the IBM 1401 and 7090 computers. Its ability to prepare reports from any files created for these machines removes completely the requirement for special routines for non-standard files. The applicability of the logic of this system to any

magnetic tape, magnetic disk, magnetic card, film, or similar file, suggests that further development will produce a completely general solution to this type of information storage and retrieval problem.

Information system design: data processing theory

The second example deals with the development of new techniques for the design of information systems. These techniques are useful to define, plan, synthesize, and implement a total information system. The techniques involved have been tested by application to large inventory control and financial accounting systems. Based on this proof of feasibility, further development and refinement are underway to broaden their scope of application and to gain facility in using these system design methods.

The techniques developed include procedures of essentially three kinds: 1) procedures for defining systems; 2) a procedure for using any problem-oriented language (e.g., COBOL, ALGOL, TABSOL) so as to make it more nearly independent of any particular information processing facility; 3) a procedure for manipulating the assignment of facilities and system tasks to points in the system so as to provide an optimum assignment.

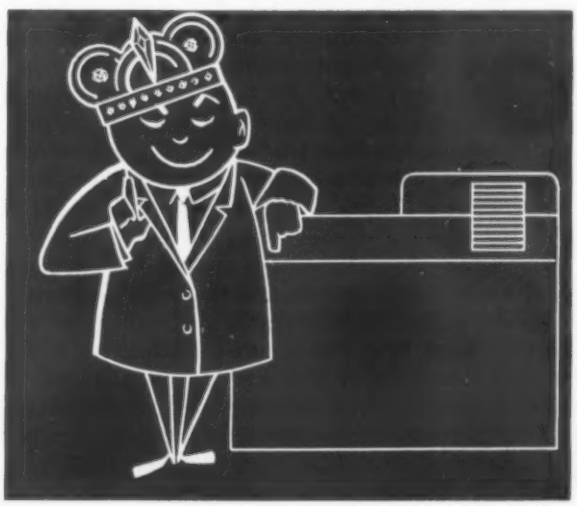
Based on these procedures for system definition and the specialized use of problem-oriented languages, a mathematical model has been developed. This model will: 1) determine every allowable assignment of individual operations to logical points in the system such that all operations necessary to solve the problem are accomplished at some point for each such assignment; 2) calculate the cost and efficiency of each information processing facility to solve the portion of the problem assigned to each point in the system for every assignment of operations to point; 3) select the best solution at each point for each assignment of operations to points according to cost and efficiency criteria at the points; 4) compute the cost and efficiency of the total system solution comprising the best point solutions for each assignment, and rank these system solutions according to the criteria of system cost and efficiency; and 5) provide information pertaining to alternative assignments of tasks to points and alternative choices of facilities at points to enable an analysis of the relationships which exist in a particular problem among these alternatives.

The techniques developed in this project serve three fundamentally different purposes, depending on the objectives of the user. The first purpose is to provide an integrated means to achieve both the design and the implementation of large information systems; thus these techniques provide the means to achieve preliminary system design and equipment selection, and detailed system programming and implementation through a continuous process which eliminates wasted effort resulting from special studies not employed in the final system. The second purpose is to provide techniques to facilitate the system definition and problem specification; these techniques introduce rigorous methods of defining the problem in terms of its component operations and specifying the effectiveness of potential equipment in terms of these same operations; in this way, the complete performance of these design tasks on a common basis for any information system problem, large or small, is insured. The third purpose is to estimate the effect of alternative assumptions or plans about system or problem characteristics on the cost and efficiency of the resulting information system; these techniques permit an evaluation of such equipment alternatives as additional tape units, the substitution of random access storage for tape storage, and the use of high speed vs. slow speed printers. They further permit a determination of the relative system cost of such problem characteristics as more stringent time, frequency, and volume requirements pertaining to the same basic system tasks.

Simulation: behavioral factors

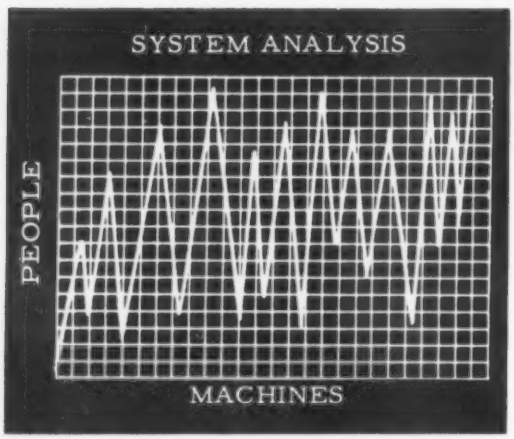
The third example deals with behavioral factors in business data processing.

The requirement for information systems involving human processes is encountered more frequently as the computer technology advances. The dependence of information systems on competent equipment design, manufacture, and programming has long been recognized. Yet these systems reflect a growing dependence on behavioral characteristics of the people who operate and use the information system and on organizational characteristics which form the system environment. Such considerations are especially important in achieving the objectives of information storage and retrieval systems now widely proposed for the implementation of many business-type processes. This im-



portance derives from the change in the role of the system operators and users (decision makers) usually implied by such systems.

The purpose of this study is to examine the effects of these behavioral considerations on the attainment of the objectives of such information systems, particularly when this behavior is a major consideration as with document classification and searching operations. As a result, techniques are sought which will enable the system designer to anticipate problem areas which may be encountered in the implementation of a particular system. The study postulates that behavioral and organizational considerations can be assessed in terms of a limited number of factors. It is further postulated that the degree of success in the change to a particular information system in a given organizational structure can be predicted on the basis of these factors.



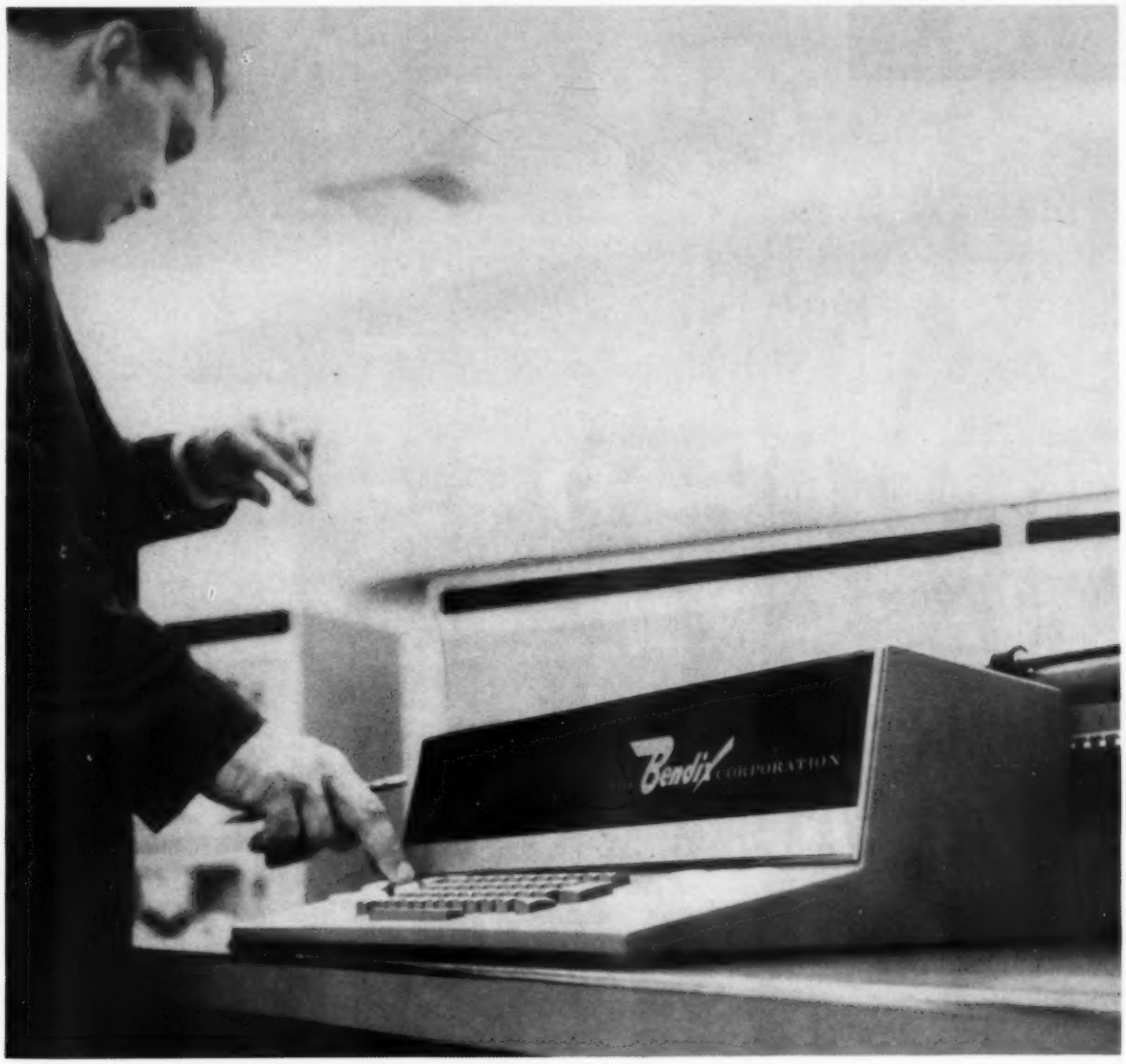
The study will attempt to identify measurable behavioral factors and to establish the relationships among these factors within the organizational structure defining the relationship among the people concerned. This is accomplished by measuring the behavioral orientation of the people and then by examining the operation of the simulated information system in a Management Training Laboratory. Particular organizational structures and their information systems are thus simulated in the environment of the laboratory. People and machines, representing those which will comprise the real situation, are participants in the simulation. The simulation is designed to place stress upon the information system with respect to the behavioral factors and their related organizational structure; as a result, their effects on the objectives of the system can be observed. After several iterations of this process, an analysis of the results permits a determination of the effects as functions of the behavioral factors in a given organizational structure. From this analysis, predictive techniques for estimating success in implementation of information systems are developed and the simulated environment is employed again to test the predictive abilities of these techniques.

The use of the method of simulation provides an essential test bed in which to study the behavioral and organizational conflict situations so characteristic of a change from manual information systems, which tend to be flexible and fit people's idiosyncrasies, to automated information systems, which tend to be rigorous and constrain people's behavior. The specially constructed Management Training Laboratory, which will be utilized on the study, includes complete facilities for observing and recording experimental results. It thus enables the creation of simulated information systems in which the study factors can be controlled and their effect recorded for subsequent analysis and evaluation.

In an area in which the importance of its objectives has only recently been recognized, this interdisciplinary study seeks to provide a research framework for investigating this vital problem of the effects of behavioral and organizational characteristics on information systems. Within this framework, an attempt is made to determine the specific probable effect of behavioral factors in particular organizations on the success of change toward an automated information system in that organization. And finally, an attempt is made to establish a quantitative relationship between some of these factors and effects. The importance of these effects to future automated information systems, and to their business, industrial, and governmental users, has been established by several researchers. This effort to establish mathematical relationships between behavioral orientation and its effect on system performance attempts to supplement intuitive judgment of these matters with empirically supportable facts.

Closing the gap

The effort to develop the basic foundations of business data processing is underway from almost every conceivable point of view. Most computer applications in business today represent piecemeal attacks on specific company problems which contribute only slightly to this goal. Other information processing studies are merely theoretical treatments of complex problems, untested by application to real life conditions. Nevertheless, by combining the work underway to develop basic theories and fundamental procedures for modern information systems with the experience gained from the actual implementation of day-to-day problems, we can look forward to the day when the gap between our vast hardware capability and our limited theoretical foundation for business data processing is narrowed significantly and for the benefit of all concerned. ■



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PART II

Effects of Computers on Personnel

By Edith Harwith Goodman, Managing Editor

Roundtable discussion of education, retraining, and responsibilities by various strata of society: educational institutions, employers, unions, government, equipment manufacturers

November DATA PROCESSING carried the first report on a Roundtable conference on the effects of data processing on personnel. Participating in that discussion, held at the MeGregor Memorial Conference Center in Detroit and sponsored by DATA PROCESSING, were: Professors Albert Blum and Einar Hardin, Michigan State University; John Diebold, John Diebold & Associates, management consultants; H. B. Douglas, Office Employes International Union; Adrian A. Flakoll, special assistant to the Deputy Secretary of Labor, Washington; Dr. Arvid W. Jacobson, ACM's chairman of the Committee of Responsibility of Computer Users; Paul M. Pair, NOMA; Everett E. Roll, Detroit Edison; and John C. Thomson, Hardware Mutuals-Sentry Life Insurance Company, Wisconsin. Chairman of the Roundtable was Alan D. Meacham, editor, DATA PROCESSING. This issue continues the report.

THE TYPE OF EDUCATION necessary to meet the rapid technological change was given considerable attention.

As Dr. Jacobson remarked, "For the first time education has become the social problem. And every sector of society should be more concerned with this problem; it has to be tackled on some cooperative basis. Management associations, the unions, and individuals must be more concerned with our education than we have ever been.

To what extent can we enhance the human capabilities?

The dilemma created by the need for both broader educational background and specialization was conceded to hinge on undergraduate college

work in liberal arts, with specialization coming at the graduate level, for those going to college. Another horn of the dilemma involves those who do not continue their scholastic efforts after they graduate from high school, and having little background are not prepared for much of anything. The unfortunate plight of those who drop out before even finishing high school was also touched upon.

The increasing educational span for some and the lack of it for others creates the gap, growing wider, between the skilled and the unskilled. This deteriorating situation is something we cannot afford at a time when more and higher skills are needed as our society grows technically more proficient.

MR. ROLL: From the limited experience I have had, I see this data processing field as producing a somewhat wider gap between the top jobs and the lower level jobs with a greater number in the lower level, and fewer at the top. There doesn't seem to be a transitional setup of jobs in between which can carry the person up to the higher level.

It does seem that there is a little wider gap now than there normally was in the manual, clerical operations, and it may be a job to bridge the gap.

However, Dr. Jacobson felt that there would not be congestion at the top, rather there is an increasing need for top people without a sufficient number being qualified.

MR. THOMSON: The gap is going to be between the great majority of society and the unskilled and uneducated. That is an area that will continue to shrink, and eventually it poses a fairly serious problem. If they are uneducable and cannot be taught, then in the society of the future, it becomes fairly rough.

MR. PAIR: There is a void and a gap between the technician, the punched card data processing manager who knows the machines and can operate them, and the computer man. There is no communication between them. That should not be, but it does exist.

MR. FLAKOLL: The need for expanded specialization at different levels is something to consider. I agree with the need for broader education, but am thinking in terms of the junior colleges and technical school curriculum.

For instance, in California, this has been demonstrably true. The capability to train technical level people in the larger metropolitan areas such as Los Angeles has induced a good deal of expansion and bringing of new industry, particularly in the electronics field.

So this becomes sort of a spiralling thing. The individual who becomes a technician has a very good chance, through management sponsored and local college or junior college programs, to go on while he is working to even higher degrees, perhaps becoming an electronics engineer.

MR. THOMSON: One of the handicaps — and this concerns the problem of teaching automation skills at the vocational level — is the problem of getting the machines. They can get a typewriter without much difficulty; they can get an adding machine, but when they get into the computers they are in rough shape. There is a place where business could reach out and help.

MR. FLAKOLL: That is a good point. At San Jose State College a machine was donated for research and specifically to train college students in the use of the computer.

To what extent this has been done I don't know, but certainly there is an area where the manufacturer can provide a good deal of assistance to the local community.

MR. THOMSON: Business itself is not on a three-shift basis. Businessmen might conceivably make machine time available to students.

DR. BLUM: At New York University the class in data processing meets at midnight.

DR. HARDIN: This is found more and more. Certainly the University of Michigan, Michigan State and Wayne State are equipped with various equipment for training in this area, but the problem comes up at the smaller schools which cannot afford this type of equipment.

MR. THOMSON: Out of the metropolitan areas especially.

MR. PAIR: At Boston University they are requiring their majors in Business Administration for a master's degree to have some familiarity with the machines, not technically but in a survey course to see what they can do. That is a step in the right direction.

MR. PAIR: The Federal government subsidizes certain high school educational training programs. One is called Distributive Education. In Chicago, about 20 of 50 high schools have Distributive Education programs with the youngsters taught in school. The instructors find places for them to do part time work.

. . . concerned about the counselling programs across the nation in our high schools, even in our junior colleges.

PAUL M. PAIR

MR. PAIR: NOMA is concerned about the counselling programs across the nation in our high schools, even in our junior colleges.

Counsellors are usually a product of liberal arts institutions and an academic rather than a business background. As I see them function — and I know many of them — they tend to counsel to their own institution selfishly and personally. They say, "Go to college." But they do not finish the story by going into the student's ability, the parental background, the environment in which that boy or girl is reared, the parents' thinking. They do not direct the child into careers in business, and to change their thinking NOMA tried an experiment.

Last May NOMA helped sponsor in our Washington, D. C. chapter an all day Saturday program entitled Counsellors Workshop In Education. They invited 60 counsellors from high schools and junior colleges in the entire Washington area to that all day program. They also had businessmen there to spell out the careers in business, the white collar jobs.

At the end of the day, they asked each counsellor if she would express her opinion in writing, and received a very gratifying response.

One counsellor said: "I had no idea that there were such careers for my seniors."

NOMA has put this pilot program into printed form and is providing it to every chapter across the country.

MR. PAIR: I am on the Office Management Association Board in Chicago and chairman of our education committee. We are making plans to make quite a big thing out of seeing if all of the counsellors in the Chicago area cannot have their horizons broadened. We cannot broaden their experience, but we can broaden horizons so they will actually help that individual boy or girl, to channel him into business training, and I am not speaking of private schools in any sense. I am speaking of business education beyond the high school level: junior college, four year collegiate schools of business and business colleges.

We are really working at this, and NOMA wants help, your help, because you are businessmen, and you are leaders. That is our attempt to solve this.

MR. THOMSON: John Gardner's introduction to the report in 1961 centered substantially on this question.

He mentioned the panic with respect to getting kids in college, and how a disservice is done to a child if it is not within his capacity, and spoke about the multitude of other forms of education that would be desirable. He heavily emphasized the need for counselling and made a strong pitch to public education to get in touch at the high school level. The idea is that this can be a continual stimulation to a furtherance or to building an educational concept, even to those

(continued on next page)

who do not complete their high school education.

MR. FLAKOLL: The subject of school counsellors and the problems encountered there is a national problem. Here is an area where industry can very effectively assist the educational community in terms of bringing these career counsellors into the business, or factory, or establishment on a periodic basis. To expose them not only to what is new in terms of occupations, but also to the social structure and feelings that are generated within a business establishment. This is a very important understanding for them to have when they are trying to impart counselling to students who do not have any real awareness of the problems that are encountered.

MR. ROLL: We do that at Detroit Edison. We bring in a group of high school counsellors for a couple of weeks.

MR. MEACHAM: Is this a recommendation that this group could make to the data processing industry? This is primarily what we are interested in — some sort of concrete recommendation to alleviate the situation.

MR. FLAKOLL: I would go a little farther and suggest that perhaps some of the educational establishments might give certain credit for this kind of experience. One of the problems counsellors are faced with, just like other teachers, is that they have to pile up an X-number of additional credits for education subjects in order to get their advanced degree, to qualify for administrative positions later. A school counsellor does not need to know why the machine does what it does, or how it is put together to make it do an operation, as much as what it can do and how it is done.

MR. DOUGLAS: I think our recommendation should be more to the familiarization with the use of the machine than with the manufacture of it.

MR. THOMSON: It is at the user level that the instruction and association with education should take place.

MR. MEACHAM: These recommendations should be referred back to our respective organizations for action.

. . . we must respect our plumbers and our philosophers, because neither our pipes nor our ideas will hold water without them.

JOHN C. THOMSON

MR. THOMSON: There is a good quote by John Gardner, president of Carnegie Foundation, that we must respect our plumbers and our philosophers, because neither our pipes nor our ideas will hold water without them.

I am working hard to beef up the liberal arts curriculum at the college level. The problem divides itself into two very distinct categories.

It was Drucker who said that the best training for management is poetry, and possibly French poetry at that. We see this at MIT, at Harvard, throughout the leading educational institutions in this country, a realization that at the undergraduate level it is far better to broaden the base of education. To liberalize it and to generalize it rather than to make an effort at specialization. We must leave to the professional schools and the graduate schools the task of really hitting hard at the top level.

The other problem is those who do not go to college. It requires a great deal of effort to improve and broaden the base and effectiveness of our vocational training.

Retraining

From Congressman Lesinski's statement:

> Generally speaking, Federal agencies plan conversions to electronic data processing with considerable care, usually feasibility studies are made before any contracts are signed.
>
> In hearings held by our Subcommittee on Office Automation and Employee Job Security, the principal problem which emerged was neither education nor training, although these are important, but rather, the problem of communication and information. We found that when agency heads start talking about conversion to electronic data processing, the employees begin to worry about their jobs — often unnecessarily — as it turns out.
>
> It is very important, therefore, that employees (both in government and industry) be kept fully informed about management's plans during the entire conversion process — this procedure will save many later problems.
>
> A memorandum, *ADP — Something to Cheer, Not Fear,* was used within the Internal Revenue Service to assure their employees about the conversion program. Two paragraphs from this paper, to a considerable extent, summarize our position on the subject.
>
> 'We are living in a day of change. The IRS for its part is dedicated to doing everything reasonably possible to enable its employees to adjust to these changing conditions without hardship to themselves or their families. The road to success in this instance, however, must be a two-way street. Our employees must be willing to accept the challenge of the times and do their part by accepting the opportunities for retraining and reassignment that arise. For some of these opportunities will take the form of jobs in other branches or divisions of the district offices. In other cases employees will have the chance to transfer to the service centers where they will be able to find new and interesting fields for applying the knowledge and experience they have gained in their district assignments.
>
> 'I hope then that you will look upon ADP not as a threat to your jobs, but recognize it for what it really is — a sound and promising program for strengthening the tax system and one in which you have every possible opportunity to play a personal part.'

DR. BLUM: This is a tremendous area for adult education, for education outside of the school, for those who will be displaced and, therefore, should have the opportunities to go and be trained. Some of you are already working in this field, and this is an area obviously that the data processing industry ought to help in. You can't learn to operate a computer until you get at it somehow. It is expensive, and this is not entirely the responsibility of the school system. It is in terms of counselling and in terms of the whole field of adult education. The school systems cannot be expected to solve all of these problems.

DR. JACOBSON: One problem I would like to point to is that of in-service people and the questions relating to reaching them, and what sort of training should be provided for these people.

We hear of vocational education, general education, and what have you. We must be mindful of the fact that these in-service people must be given basic education. There is no royal road to these things. We are up against a very difficult new technology, and we simply have to reach these people and get them to hit the books again.

This is the critical problem.

MR. THOMSON: Would you define basic education?

DR. JACOBSON: Today the most critical area of basic education relates to quantitative and logical concepts, methods and skills.

DR. HARDIN: I would like to draw attention to a couple of things which have not been mentioned, one in the field of training. We have a great need for psychological studies of the attitudes of persons towards undertaking training, the attitude change which accompanies training, and attitudes of employers towards persons to be trained.

MR. THOMSON: This is the place where society lifts itself by the boot straps and it is going to take a tremendous change in the concept of education.

There is a desperate need to get every man, woman and child interested again in reading.

The duty cannot be delegated entirely to the Federal government, a great deal of it rests with education first, and second, with an improving corps of management people, people who do have imagination to innovate.

(continued on next page)

. . . not an innate incapability but rather poor teaching; a wrong emphasis on values.

ARVID W. JACOBSON

Replying to a question of how many people could be trained for computing:

DR. JACOBSON: There is no absolutely documented answer to that. When I taught in industry I came in contact with people who had no training prior to coming to the trade school and the engineering school. I am an optimist. *I feel that the human mind is extremely wonderful, a capable thing. I don't think we have scratched the surface.* I have seen people actually go through a transformation over a short period of time.

We are here concerned with the quantitative type and logical type of thing. When I mentioned that I think mathematics education in our high schools was in a sad state, which fortunately is being improved, likewise the language area, this is not a reflection of innate incapability but rather of poor teaching; a wrong emphasis on values. Instead of having one hour, five days a week, on family living, and two hours a week in physics, we could very profitably change them about and have two hours a week on family living and perhaps five hours a week on physics and mathematics, and language and history — basic subjects.

This is one of the great problems, and we have made progress in this area.

I want to make another remark pertaining to my own field of mathematics. I have felt that the teaching of mathematics has been extremely mechanistic, and the teachers have been poorly trained. Coaches have been teaching mathematics, and they have somehow communicated their fear or dislike for the basic subjects, not only math but the other subjects as well.

Secondly, the American mathematical fraternity for the past 30 or 40 years has felt that the only respectable aspect of mathematics was the abstract pure type, and anyone who was concerned with the real problems of business and industry had his hands soiled, and was looked down upon.

In other words, mathematics was not properly related to the actual problems of society and the individual.

Today mathematics has become the practical science, the practical art, by virtue of the computer, by virtue of the various models that we now have in social sciences which have been developed. I suppose they have interacted, and we are now faced with a large sector of our population being pretty illiterate in the field of quantitative and logical ideas and skills.

Mathematics is not esoteric. May I give one case history?

I had a person come to me just a year ago; he had a degree, he had learned several languages. He was working in a computing installation in an industrial firm, and he had acquired a tremendous inferiority complex towards mathematics. He said he never could learn it.

I persuaded him to take our basic math sequence, and he went through that from high school algebra through calculus in six to eight week terms. His attendance record improved, no problem; his work performance improved beyond comparison. He is a much more efficient and a happier employee.

We have to dispel this foolish notion that certain areas are beyond the capability of average individuals. This is one of our serious problems.

Responsibility

Responsibility was attributed by the participants to various segments of society for diverse phases of the problem. Mr. Roll felt that the equipment manufacturers had an obligation to warn customers of problems which they may face other than the technical problem.

"It isn't their job necessarily to tell the customer that he has to keep these people on or anything like that, but he can alert them to the fact that there are these social and psychological problems that may be run into. . . . They are not just selling hardware . . . they are selling a system, and a system has got to be operated by people. It isn't going to work unless people are acclimated to doing the job, and not resisting the change."

MR. DIEBOLD: The individual has a good deal of responsibility here also, each individual. This is true in every walk of life; a person has a definite responsibility.

MR. ROLL: Management has to motivate him to accept that responsibility, too. The educational institutions have the responsibility of research and to keep in touch with the needs of industry.

Dr. Blum wondered what happens when a new branch is opened away from the old establishment; is it the responsibility of management to move the workers?

To which Mr. Douglas replied that the union insisted on seniority rights, but ran into a problem where older workers did not want to learn a new job. He attributed slowness in automating office work to the expense involved which included, for responsible companies, not only the actual installation costs but also retraining, retention of people until attrition kept actual discharges from occurring, and physically moving people and goods to new locations.

Dr. Blum mentioned the immediate fact is that there is some kind of technological unemployment at present and it is a basic issue for the individual unable to find a job.

DR. JACOBSON: I am the chairman of the Committee of Responsibility of Computer Users, in ACM. As we have heard many times, technological advancement and man's manifold increase in power also imply a corresponding increase in the social responsibility of man. We must begin to have a stronger feeling for our brothers.

MR. PAIR: A few months ago, Time magazine had a page entitled *The Automation Jobless*, and they used a good phrase there: "Not Fired — Just Not Hired."

MR. ROLL: The fact that most of us have attempted to do these things with a minimal effect on people is evidence that industry does realize its responsibility in this area.

This does not take care of the people that we didn't hire, that slack has to be taken up somewhere.

I would like to see industry, education, the social researchers, and the manufacturers have a chance to solve some of these problems before the government jumps in with both feet, and we could do a great deal in that direction.

Dr. Hardin said that much depends on how government acts in stimulating the economy so that more jobs are created. He felt that retraining was predicated on a high level of employment and that only the Federal government could provide a general stimulus to the economy, that state governments were not big enough to do so.

MR. FLAKOLL: There are a lot of questions that haven't really been answered with reference to the research that is necessary before a vast federal program on retraining can be embarked upon, especially, retraining for what?

From the report of Congressman Lesinski came this statement of responsibility.

I would like to make only one point on this subject. In the Federal government we have felt that the responsibility for a smooth conversion to EDP lies principally with management, which, after all, stands to benefit most from automation.

In our Subcommittee *Report on the Use of EDP Equipment in the Federal Government*, released last August, we made the following recommendations:

'Retraining to equip with electronic data processing skills should be made available at government expense to employees scheduled for displacement. The provision should be made sufficiently in advance of conversion to enable employees who are qualified to be retrained to obtain first consideration for the new jobs.

'When there is a displacement of employees resulting from conversion to electronic data processing, the agency should impose a freeze on hirings in those grades for which the displaced employees can qualify within the agency.

'Transfers to other jobs of employees displaced by electronic data processing should be effected on the broadest possible basis — to other parts of the agency, other agencies

in the locality, and other localities. When necessary, the government should take steps to assist employees to obtain jobs in private industry.'

Federal legislation efforts to aid in retraining on a national level were put off when Congressman Holland's Manpower Bill was shelved in the Rules Committee.

MR. DOUGLAS: Basically, the problem is the over all loss of clerical jobs as a result of automation; although I recognize that we are going to have a vastly increased group of professional people, the clerical job will not be there.

We have to find a formula for the companies that are consolidating, centralizing their accounting, information and paperwork; they completely do away with entire establishments. Their employees are the people that are going to have problems in finding a job — and this is a tripartite responsibility between management, labor, and government.

Because of the type of system that we live under, competitive business, management of individual companies is going to continue to strive to be in a better economic position than competitors.

So there will have to be some sort of regulation or assistance through the Federal aid for moving people, retraining them, and knowing in advance what to retrain them for.

There is no sense in retraining a punched card operator on some other job that is no longer in existence, and moving him to another place to be an unemployed something else somewhere else.

This is the biggest role that government can play, in obtaining this information, making it available, and then requiring management to go along with it. It is a pretty big order.

MR. FLAKOLL: We have a national problem to be concerned with. The Federal government has a responsibility. They have carried it out in part, to date, in dramatizing some of the issues that confront the entire population.

The next step is to define the problem to the fullest possible extent. This has not yet been done.

The Federal government has a real role to play in terms of sponsoring certain types of research in this effort.

The individual citizen must be made aware of this as his problem, not just from a standpoint of national goals, but in terms of the exploitation of his own potential to the fullest degree.

There is a challenge for industry, both the data processing equipment manufacturers and business in general, to assist education and the local educational facilities.

There has been a tendency in the past on the part of business to criticize, as far as education is concerned, without being constructive in assisting the educational community in strengthening itself to meet the challenge.

As far as the whole community is concerned, this is where the battle is going to be won or lost, as far as our entire national structure is concerned. ■

When 10 men of varying backgrounds and experience, each with an exposure to the complex relationship between people and equipment, sit down together and discuss a universal problem, they can start a chain reaction. Like a stone dropped into a lake, the results of the suggestions made at this first *Data Processing* Roundtable can be far reaching.

Because the relationship between man and machine is so complex, and this technological revolution has only begun, it was difficult to obtain a clear statement of the problems and firm points towards their solutions.

It is a credit to the Roundtable participants that they accomplished their task in such a highly competent and informative manner.

We wish to publicly thank these men for interrupting their busy schedules and travelling many miles to participate in the Roundtable.

The Editor

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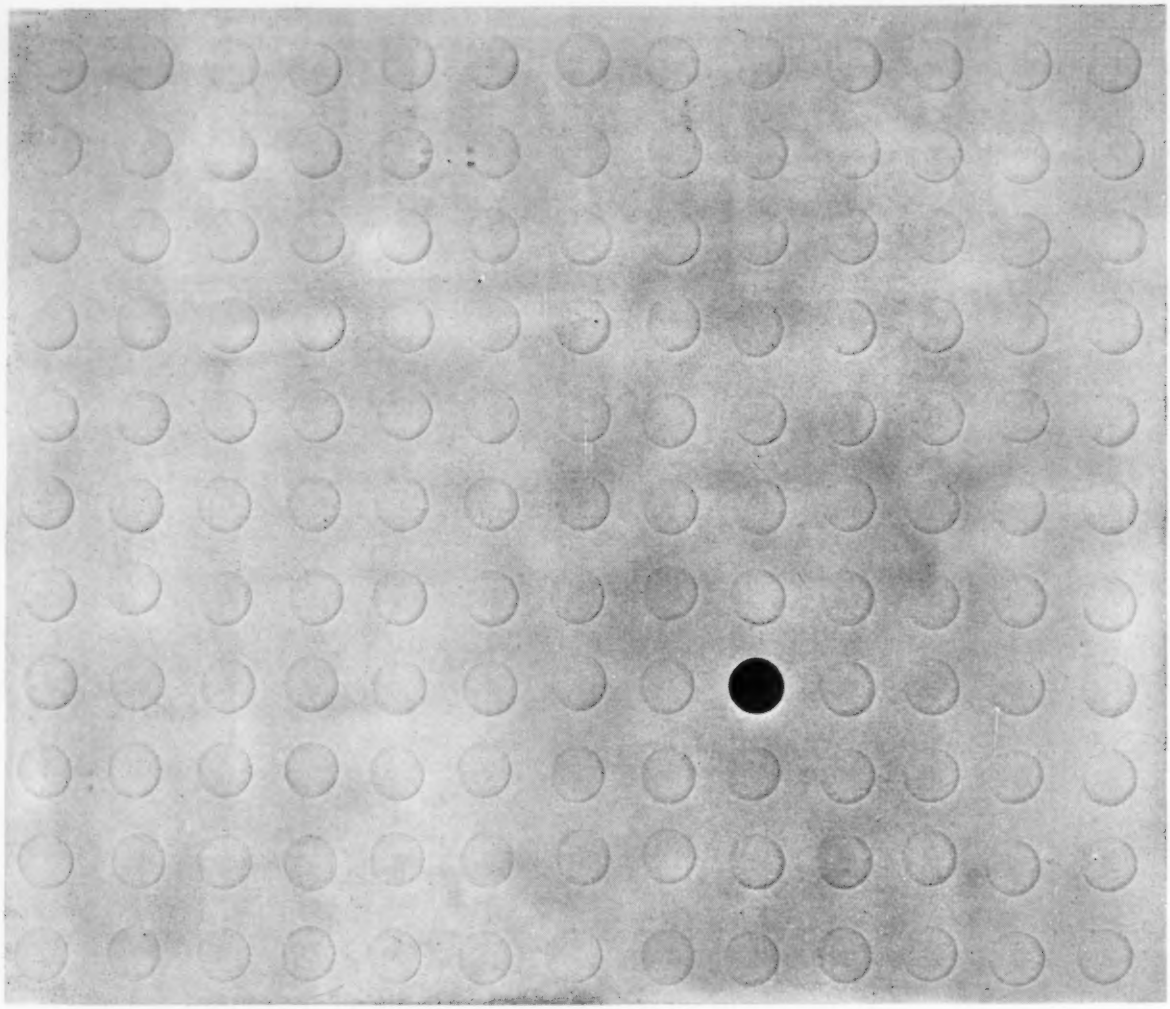

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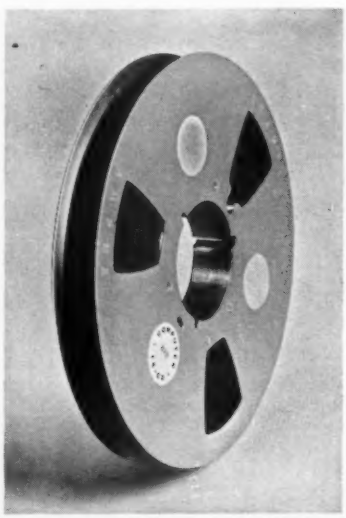

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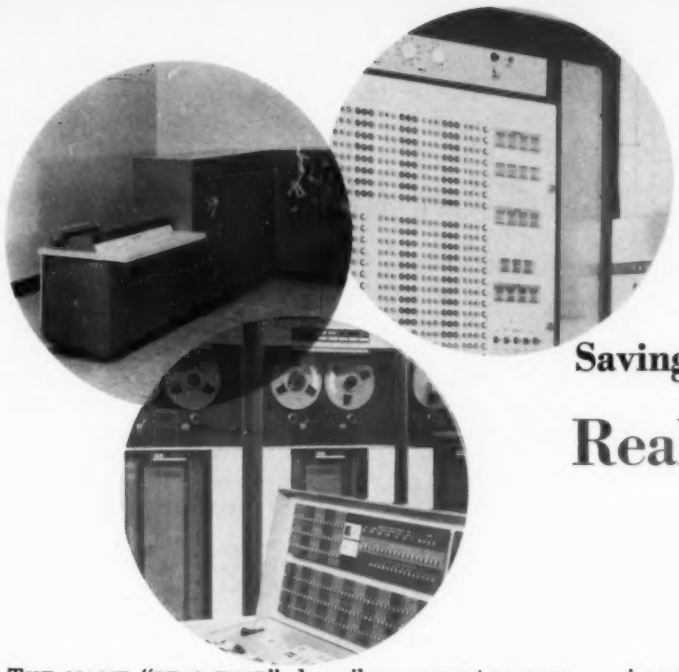

Savings Bank Automation with

Real-Time Computers

THE NAME "REAL-TIME" describes computer operation that is simultaneous with an event, such as controlling and altering the trajectory of a missile in flight. Until fairly recently, real-time systems had been used chiefly for military and industrial purposes.

The United States Air Defense Command's well known SAGE (Semi-Automatic Ground Environment complex) system uses real-time computers to analyze the air situation at any point in time. Summary information from each of 22 input locations is sent to the central computer in Colorado, where findings are tabulated, recorded, and distributed.

The Strategic Air Command also uses real-time computing, as does the Signal Corps in the Army European Command.

Industrial process control is also being done by real-time computers in such industries as public utilities, chemical manufacturing, petroleum refining, and iron and steel manufacturing.

There has been a trend to planned developments and new applications of real-time computing in commercial data processing. Now that the reliability of computers is guaranteed 24 hours a day, seven days a week, they are feasible for a constantly increasing number of uses.

Real-time commercial projects

The first major commercial installation was in airline reservation systems control. Seat availability, sales, cancellations, and flight data of all types are constantly ascertained and executed by computer. Capabilities now exist for handling the complete passenger record, including the passenger's name and address, and the handling of complete airline logistics problems. A reservation agent needs only to press a few buttons on his agent set (an input-output device to the central computer), and, within a matter of seconds, an accurate up-to-the-minute reply is made by computer.

An operation of this type has been contracted between IBM and American Airlines. IBM's Sabre system is composed of two IBM 7090 computers and associated equipment. The annual rental charge is $5,000,000, and it is expected that by the end of 1963, all cities in the American Airlines system will have hookups with the central computer.

One of the most significant new applications of commercial real-time computing is in the field of banking. For example, one of the largest mutual savings banks in the United States has recently purchased a $2,000,000 UNIVAC 490 real-time on-line computing system capable of handling 800,000 accounts — and expandable to handle 2,000,000. The bank now has 570,000 accounts.

The bank estimates that savings in operating expenses will pay for the UNIVAC and also give the bank approximately $1,830,000 in 10 years. The system will reduce teller time and clerical costs. Tellers will no longer have to do any filing or card-searching. They will not have to move from the teller window. A great deal of the bank's filing will be completely eliminated. In addition, of course, the speed with which this new system handles transactions will decrease the time depositors wait at tellers' windows, even at dividend and luncheon periods.

In effect, all savings accounting will take place automatically, while the customer is standing at the teller window.

How system was selected

Selection of this system came as a result of an extensive study undertaken by John Diebold & Associates, Inc., retained by the bank as consult-

ants on the project. The process of selection is interesting in a number of ways.

It was first determined that the equipment chosen would have to be an "on-line" system. That is, one in which the tellers, the processor, and depositors' records are all interconnected by an electric communications system. Transaction information, passbook updating, and account record change are all accomplished at once, with no recording on an intermediate document.

An off-line system would have been less expensive to install and operate, and probably would have achieved savings over present data processing costs; but the off-line system would have little or no effect on banking floor operations.

The off-line system would use the recorded results of depositor transactions as input to a processor and return depositor information to the banking floor for reference and use in transactions. Thus, it would accomplish only part of what the on-line system is capable of doing. The off-line system would have saved on card processing, but there would still be need for people at each branch to integrate information. The off-line system is not as current, not as adequate. No saving at all would be made on the time for a teller's transaction.

The important advantages of the on-line system are that it allows depositors to bank at any one of the bank's branches and at any window in the branch; it significantly speeds up the banking transaction, thus making it possible to serve a greater volume of depositors without a proportionate increase in cost; it makes possible completely current savings account activity reporting. An off-line system would have provided none of these advantages.

Equipment proposals were made by IBM, RCA, NCR, and Remington Rand. The selection of equipment was based directly upon adequacy as an on-line savings account system.

Having established that the use of an on-line savings system would give the bank an important competitive advantage in customer service; and that it would also give the bank the system flexibility needed to continue improving customer service and to expand its depositor base without further major systems changes, a group of seven system-selection criteria was set up.

The criteria were:

Reliability — the system must work as close to perfectly as possible.

Speed — the system must carry present and future workloads, and improve on the time now necessary to do so.

Expansibility — the system must be able to absorb future growth, with a minimum of expense and disruption.

Flexibility — the system must be adapted to changes in systems requirements because of policy changes or growth.

Manufacturer capabilities — the system must be provided by a manufacturer who can furnish a high quality of service and who will grow with the bank.

Ease of operation — the system must be operated by bank personnel with minimum effort and minimum special requirements.

Cost — the system must be available at a reasonable cost.

All four of the manufacturers met each of these criteria. The decision was based upon which company satisfied the criteria, particularly the most important criteria — e.g., reliability, flexibility, speed — with the highest degree of efficiency. The selection of the Remington Rand equipment was also influenced by the fact that the company proposed the only system specifically designed for on-line operations.

How it operates

In the bank's new UNIVAC 490 system a central computer will simultaneously control transactions at tellers' windows in each of the bank's five branches. Each teller will use a UNIVAC Unisaver Teller Set, about the size of a typewriter, to transmit deposit and withdrawal information to the computer. The Unisaver utilizes regular leased-line voice-channel facilities. Up to 4,096 teller sets may be used in a single system.

The Unisavers are similar to the agent sets used by airlines. An amount keyboard is utilized to supply numerical information, i.e., account numbers, old balance, amounts of deposit and withdrawal, and code numbers. All keys are automatically cleared at the completion of each transaction.

The teller inserts the passbook in the Unisaver, presses the proper keys, and the transaction is electronically transmitted to the centrally located computer, where all records are maintained on high-speed random-access drums.

The computer instantly updates the customer's record and transmits the current transaction, plus any earned dividend since the customer's last visit to the bank, back to the Unisaver. Data travels at a rate of 1,200 bits per second.

When multiple transactions take place, the book is automatically positioned for printing the next entry. The book is ejected from the Unisaver when the last line of information for a transaction has been printed.

Where more than one line is printed, the passbook is repositioned by the Unisaver, which then informs the computer to transmit the next line.

A journal tape automatically duplicates all bankbook entries. Thus, in the event of computer failure, the teller sets can operate independently. The teller machine calculates the transaction and enters the result in the customer's passbook; it records the transaction on the journal tape, which is reinserted

to update the computer as soon as the machine is again in operation.

Reliability is, however, prerequisite to any on-line system. Failures are very rare and usually predictable beforehand. Two servicemen will be permanently posted at the site so those failures which are not foreseen and averted will be taken care of immediately. The overall percentage of reliability of the system is very high — something above 98 percent. It is difficult to arrive at any exact figure, because most failures are corrected before they ever happen.

The system is capable of handling 50,000 customer transactions per hour. Since only a slight fraction of this capacity will be needed, the machine is programmed to handle various other off-line computing concurrently. In a matter of milliseconds the computer can switch from on-line savings depositing and withdrawal to mortgage accounting, payroll processing, life insurance notices, personnel records, Christmas Club accounting, general expense accounting, consumer loan accounting and processing, or any other banking operation for which it might be programmed.

It is interesting to note that the 30 hours now required to prepare the bank's mortgage notices — a very complex and difficult process — can be decreased by the computer to less than three hours.

The machine will be working constantly at off-line processing. When an on-line inquiry is made by the Unisaver, the computer "drops whatever it is doing," processes the on-line transaction, and instantly returns to its off-line processing.

Completion of the installation is scheduled for March, 1963.

With the proven reliability of real-time systems, applications are being extended at a rapid rate. The National Cash Register Company has just sold a similar system to another New York bank. The $1,117,000 automated system includes two NCR 315 computers with NCR Class 42 machines at the tellers' windows. Other banking installations are expected in the coming months.

Other applications

In addition, a number of commercial applications other than banking are being developed.

One large commercial operation has on order a machine which will analyze and route incoming messages for the entire company. The computer receives every message sent in to the company, and relays it to those persons for whom it is pertinent.

Another system has been rented to a very large company to handle order entry inventory control. Sales clerks will transmit every transaction to the computer, which will record the transaction, take the item out of inventory, and provide up-to-the-second information, thus saving time and expense, while adding considerably to the accuracy of inventory and production control. This system has been rented for approximately $60,000 a month. The buyer has already spent over a million dollars for programming and special research.

A planned application of real-time computing will have the machine doing a digital statistical analysis of large quantities of analog information.

Another application, still in the planning stage, will provide inestimable savings for large mail-order companies and companies with central shipping to many district offices throughout the country. The system will provide real-time routing and shipping control and will be capable of processing some 60,000,000 items per day. The procedure will be similar to that used in banking.

Indicative of the increasing acceptance and interest in real-time processing, is a statement recently made by the president of the above-mentioned bank, regarding the purchase of the UNIVAC 490 system: "The UNIVAC installation is designed to provide maximum accuracy, and to do it at a substantial saving over present methods. I consider ordering this equipment one of the greatest steps forward that (the bank) has ever taken in depositor benefits and better job opportunies for employees." ■

These monthly reports from John Diebold & Associates, Inc., are written exclusively for *Data Processing* (for American publication) and *Automatic Data Processing* (for British publication), and appear concurrently in both magazines.

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Marien on FORMS —A Monthly Feature

Optical Scanner Systems and Forms

RAY MARIEN

SOME VERY INTERESTING MATERIAL in the forms and systems fields has come out of the first two *Forms Forums*, held in New York City this year. The Forms Forums are sponsored by the Transkrit Corporation, and this columnist has the privilege and pleasure of being chairman of the group. The last session dealt with a comparison of M.I.C.R. and optical scanning and much valuable information was presented by a specially invited panel. The panel members were: Mr. Charles Metz, Assistant Manager - Operations Division, Chemical Bank New York Trust Company (M.I.C.R.); Mr. Robert W. Gallant, Assistant Vice President, Chase Manhattan Bank (M.I.C.R.); Mr. Charles Koenig, Assistant Manager-Data Processing, National Biscuit Company (scanning); Mr. J. E. Bull, Assistant Vice President, First National City Bank (scanning); and Mr. Joseph R. DeParis, Manager - Systems and Data Processing Research for the F & M Shaefer Brewing Company, who presented the "impartial observer's" viewpoint. As you well know, Mr. DeParis also has a regular column appearing in DATA PROCESSING, along with this author.

This month we will cover the scanning side of the picture, as well as giving Mr. DeParis's observations.

Mr. Koenig reported great success at National Biscuit with a major Optical Character Recognition application. It is used to capture sales information *without* changing existing equipment at the originating locations, except for a type font change to the special "Self-Check" font. Their OCR machine (made by Farrington) processed 60,000 line entries daily of eight average characters per line, with a maximum of 10 per line. Rejects, when they occur, are due to either partially printed characters, smudged or shadow-printed characters, or poor ribbon quality and uneven printing.

Scanner form

A special form was designed for use by their sales branches in submitting the required scanner input material. This form was tailored for insertion into a wide carriage adding machine and to conform to the form feeding mechanism of their scanner. This document can handle from a minimum of two, to a maximum of 28 lines. This form was revised once since its inception in an attempt to improve the quality of the input media by using a heavier bond paper of whiter texture. This allowed for a greater contrast of the printed character in comparison to the background. This modification improved the reading quality considerably and resulted in a lowered reject rate.

The National Biscuit Company system requires two key punch operators to handle rejects and only *one* scanner operator. This compares with 18 key punch operators and a like number of machines that would be needed in a key punch system.

Mr. Bull said that First National City Bank uses a heat transfer master in a high speed printer at the rate of 1,200 lines per minute, to produce completed checks. The machine is equipped with optical scanners which do *not* read, but which *check* the presence or absence of data in a particular area. He added that the high-speed printer and the heat transfer printer must be correctly adjusted, the paper and carbons must be exact, and the pressure and room temperatures must also be in line in order to achieve good results from the scanner. Thus, maximum precautions must be observed to assure top quality work.

Mr. Koenig added that they are favorably impressed with the results obtained in scanning "sub-standard" documents. They have a proof method that they worked out over three years by which they get only a four percent reject for the lines they process.

Mr. DeParis, playing the role of a neutral observer, said that both M.I.C.R. and optical scanning have made a real breakthrough in the input area of data processing. He believes there is an assured place for both in the field. One point in favor of the rapid spread of optical equipment is the fact that *normal* business equipment can be used at the source instead of expensive special equipment. He cited re-entry type documents and re-circulating documents as obvious conversions to scanning. An example of this would be utility bills, which have a detachable stub that is sent back to the utility company with the customer's check.

Next month we will cover some M.I.C.R. applications outlined at the *Forms Forum*.

■ ■ ■

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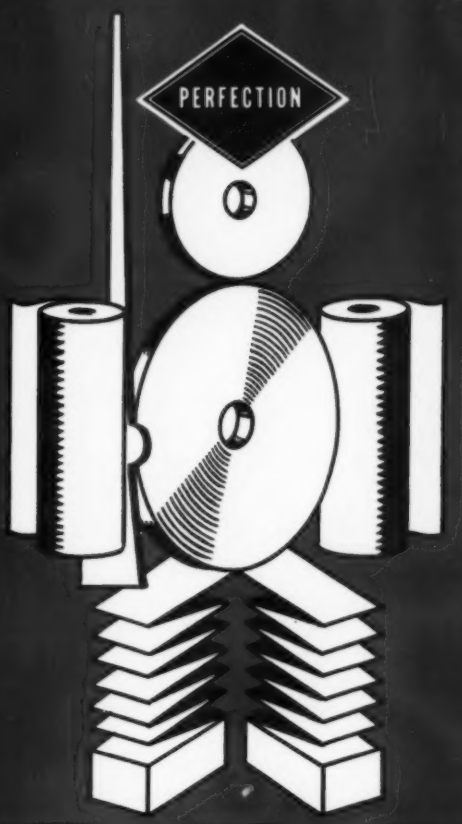

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PETER F. DRUCKER

Management For Tomorrow

An industrial consultant's viewpoint on future managers increasing responsibilities

PETER F. DRUCKER, industrial consultant, speaking before the NAM Executive Conferences on Management of Human Resources, in a series of five meetings across the country, emphasized the change in our outlook for management, workers, and the economy.

One of the factors which is going to make the greatest difference to our entire business way of life is international competition, for as Drucker said: "An economically unified Europe would be not only two or three times as great in economic power as Soviet Russia, it would be at least as great in economic power as the United States. The key countries on the Continent have been growing more active economically these last 10 years than we have — more actively also than Russia. It is from a revised Europe that the competitive challenge arises."

This is the competition that is changing the demands on managers, all of whom must try to obtain economic performance, and achieve this through organizing human efforts, their own and others.

"The only way to defend profit will be through maintaining capacity to compete," said Drucker.

Who achieves economic performance is the challenge to all managers, regardless of what kind of work they do. There is a shift, already in evidence, from manual work to what he calls knowledge work, and he offers an old definition, "economic advance is the progressive replacement of work by brute force through work by knowledge and concepts."

He questions that we have advanced in this by saying: "I do not see any results, whether in terms of profits of a company or performance of the economy."

Thus he believes we do not yet know how to make real use of this knowledge resource. Learning to make it truly effective is one of the great jobs for tomorrow's manager.

"Knowledge work is not productive unless it is concentrated. We have to change our outlook from the past half century when industrial engineering skills made most manual jobs simple enough for the average person.

"In manual work you can replace one first-rate man with two mediocre ones. In knowledge work you cannot."

Efficiency is no longer a pertinent measure of work in the knowledge area, only effectiveness counts. Unfortunately we have not yet learned to organize for or to measure effectiveness.

As Americans are by far a small minority among the world population, they cannot compete on manual strength or skills and our area should be leading with knowledge work.

"We have to excel through the performance of our knowledge work. And this is a new task for the manager, a task which both enables him to make a much greater contribution, but also puts him against a new and big demand."

Among the dilemmas which must be solved is the increasing need for specialization, towards which we are rapidly moving, and the contra-pole of increasing occupational and job mobility.

"The more specialized a man is, the more he can achieve within a narrow area. But also the more difficult it is for him to move out of one and into another area. . . . Today's crafts might easily disappear overnight. The flight engineers are a recent example. They only came into being with the four engined propeller airplane, and fifteen years later, with the coming of the jet, they became obsolete."

Today an instrumentation engineer is out of his depth in any other area. A computer logician knows an enormous amount about very little — and he cannot easily move into other areas of mathematics.

Even older crafts may disappear overnight, some in existence for a long period. One example Drucker used was printing, which he believes probably will be done in the future by inkless reproductions, such as now used in offices, which will require skills but not the old skills of lithographer or typesetter.

Job mobility is being restricted, not only in factories by labor contracts, but also in areas of salaried work in accounting, engineering, and even in personnel.

To maintain our economic performance we have to foresee and plan for the clash between specialization and mobility — for we need both — and that will be a managerial job.

"The development of people will therefore become an increasing concern and in itself, one of the major and new dimensions of the job of managing.

"It is the manager who is the visible difference between the economic system of the Free World and those of the dictatorships. The basic difference is that the Free World believes in a variety of autonomous, self-governing decision centers throughout society, and especially in the economic sphere. The dictatorships believe only in technicians who carry out the orders of a central, all powerful decision maker."

Drucker bases his future look on two hopeful assumptions:

That there be no total war within the next few years; and that there is also no world wide political defeat of the United States and of the cause of freedom and decency for which we stand. ■

An interview with Peter Drucker

In an exclusive interview with Peter F. Drucker, DATA PROCESSING Magazine wanted to know what part data processing equipment and processing would play in this future picture.

"One of the most important things that data processing can do is to furnish managers with *information*," said Drucker. "At the present time management is being drowned in a sea of *data* which puts such a drain on time that often managers are better off without any of the reports.

"Reports and figures come through but are not actually designed for anyone in particular. Top management does not always get information in good usable form."

Data processing technicians are too concerned with their hardware at this point, Drucker believes, and the managers are not sure of what they need and do not ask how they can get information especially designed to help them manage and make decisions.

"Most manufacturing companies are still run by the *braumeister's* nose," said Drucker, feeling that in spite of the upcoming automation machinery, much business is still run by intuition or hunch. But the intuitive manager is going to be obsolete and will be replaced by the man able to handle systematic knowledge.

To get effective results there will have to be deep organizational changes, cutting across traditional organizational lines of the present.

The best use of computers is being made by production management, Drucker feels, and office data processing is the application of those methods to the office.

While today it is the trained technician who can do programming, an increase of these many fold in middle management is foreseen by Drucker. In another decade nearly everyone will be programming. Nor does he think it is such a tremendous job to learn programming, for he claims that he can teach anyone to program for ordinary data processing in three hours, after that it is just practice. To back up his claim that there is no great mystery involved he cited as an example his 17-year-old daughter who taught herself to program from books and could actually make her programs work when he got her access to a medium sized computer.

It takes five years, Drucker believes, for management to learn to live with a new computer installation. In the first stage there are fantastic expectations, and for about three years these lead to frustrations and mounting irritation. In the third stage either the computer is abandoned or management comes to realize that it is only a tool, which to be effective must deliver what they need. And management must decide what the information needs are for its particular operation.

DeParis on EQUIPMENT —A Monthly Feature

Programming Languages

JOSEPH R. DE PARIS

PROGRAMMING is the art of putting together a logical sequence of instructions which will direct the actions of a computer system. In the early computer days programming was accomplished by writing the instruction sequences in the language of the computer. This was known as writing in absolute or machine language.

This coding method proved to be slow, difficult, and prone to error. As a result, the idea of mnemonic or symbolic representations of machine language was born. Today, programming systems of many varieties are available to facilitate the programmer's job. As a result of this effort to simplify and speed up coding, so called automatic programming systems have evolved representing successively higher levels of language in computer programming.

There are at least three language levels represented in programming. The highest level is a common language, such as Cobol, oriented to the requirements of a problem, not to the requirements of any particular computer. The intermediate level is represented by the many symbolic programming systems which are written in a language oriented to the requirements of a specific computer. The lowest level, the one to which all higher levels must ultimately be reduced, is actual machine language.

In the process of developing these higher language forms and of reducing them automatically to actual machine language, a new lexicon has come into being. Not being universally defined, many of these terms are not understood or at best are used casually and interchangeably. Needless to say, an oft-confused art becomes even more confused.

Let's trace the phases which usually take place in translating a program written in a higher language like Cobol to the actual machine language of a specific computer. Then we can attempt to explain some of the technical language.

How Cobol is used

For our example, let's assume that the program is written in Cobol. The program as written is called the *source program*. The *source program* is input to another program called a *processor* or *compiler*. One function of the processor is to translate the Cobol language of the source program into the intermediate language of the computer. This is the symbolic programming language available for each type of computer. Another function is to explode the *macro instructions* of the source program into the many individual instructions they represent. Accordingly, the output of this pass against the processor is another program in the symbolic language of the computer in question.

The final phase is to enter the symbolic program as input to be processed by the *assembly* portion of the processor. The functions of the *assembler* are to assign actual storage addresses to symbols and to convert symbolic operation codes to actual operation codes. The output of this phase is a program called the *object program* which contains the job instructions in machine language.

These phases are generally representative of the procedure involved in translating a higher level language to the machine language of a computer. Sometimes the processor embodies both the compiler and assembler sections, sometimes the assembler is separate, but in either case the sequence of events is the same.

Terminology defined

Let's go back now and look over the new semantics and explain what they mean. First we have the expressions, *source program* and *object program*. The *source program* is the instructions as originally written, i.e., Cobol, Autocoder, Soap, Fact, Algol, etc. This program is translated by the processor into an output program called the object program. The *object program* is the end product, a program in the machine code of the computer. It is this program which will be used over and over again to process transactions through the computer.

Sometimes you may find the expression, *source computer* or *object computer*. *Source computer* refers to the computer being used to generate the object program from the source program. *Object computer* refers to the computer in whose machine code the object program is being turned out. This situation comes about because it is possible to pass the source program through a higher level computer to generate an object program to be run on a lower level computer; hence the one is the source computer, the other the object computer.

Looking back, we see reference to *processor*, *compiler*, and *assembler*. Still another term in common usage is translator. *Processor* and *translator* have the same meaning; therefore, they can be and are used interchangeably. A *processor* is a program which will translate a high level source language into a lower level language, ultimately to the machine code of the specific computer involved. In the case of a source program written in Cobol, there is a different processor for each possible object computer. Cobol itself is a common language; it is the Cobol processor of the object computer which translates this common language into the native language of the computer.

Translators, assemblers, and compilers

Continuing with this translation theme, there are two basic types of translators, assembly programs and compilers. An *assembly program* generates one machine language instruction for each source language instruction fed to it. Assembly is the last phase in the process of translating from source program to ob-

(continued on page 50)

Modular 5 high units, store 24 reels per level, per unit.

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Wright Line now offers you the complete answer to Tape Handling and Storage. The entire line has been designed to give you flexibility, capacity and economy.

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By William L. Hooker

Control Standards for Punched Card Equipment

Controls may make difference for justification of equipment

WHAT IS YOUR COST? It might be far more than you think!

It is a basic axiom that in any competitive business field any item of cost must be substantiated and a continuing effort made to reduce that cost. When a concern has decided that the end of the road has been reached with respect to cost, it is undoubtedly right; it has reached the end of the road — period.

A good incentive to keep in mind is that every one dollar of cost reduction is equivalent to a $14.00 increase in sales volume; these are pretty good odds.

With respect to any equipment which requires the outlay of money, the cost must be justified.

The question is how. The answer is quite simple — *production* and *usage controls.*

The following controls can be used on most any type of equipment. They are easily installed, simple to maintain, accurate and inexpensive.

The prime intent of the controls is to provide facts which will replace the all-too-common state of *apriori,* by which too many cost figures are obtained. Data provided by these controls will determine the usage of the equipment and whether the equipment is fulfilling the intent of purchase.

The tools needed for these controls are:

1. An inexpensive meter (about $50.00 installed)
2. Job report sheet (**Figure 1**).

Actual usage of most all equipment can be recorded by the installation of these meters. The meter must be so installed that it would operate only when the machine itself is actually operating. Therefore, it must function only when the card feed mechanism of the machine is operating. The recommended type of meter would be one wherein the dial reading would be in hundredths parts of an hour, such as 009:67. The installation of an external receptacle to accept the meter plug is recommended for quick interchange of meters as required.

Job record sheets would be available on each metered machine on which would be recorded the following (**Figure 1**):

1. Meter: start and stop readings
2. Clock number (optional)
3. Job number and operation number
4. Set-up code column
5. Wall clock: start and stop readings.

The above information requirements are basic. Additional data may be recorded to fulfill individual needs.

In practice, upon being assigned or starting a job, the operator would record the above basic information on the job record sheet, signing in at the start of the job and signing out at the end of the job. In the event that the operator is running

Figure 1

MACHINE TYPE 407 MACHINE NUMBER 12 — MACHINE TIME ANALYSIS — DAY — DATE

REWORK CODE:
1. Operator
2. Machine
3. Planner
4. Outside Dept.

METER READING
Midnight .....
8 a.m. .....
4:45 p.m. .....

17	23–27 / 28–32 METER		37–42	43–52	53	57–62	63–65	X66	68–70 / 71–73 ELAPSED TIME		X76
REWORK CODE	START	STOP	VOLUME	CLOCK NO.	SHIFT	JOB NO.	OPER NO.	SET-UP	START	STOP	X IF OT
	673'90	674'00		12734	1	159064	10	X	13'1	13'2	
	674'00	674'10		12734	1	159022	32	X	13'2	13'5	
	674'10	674'20		12734	1	465520	2	X	13'5	13'7	
	674'20	674'25		12734	1	159022	38	X	13'7	13'8	
	674'25	674'60		12734	1	465520	2	X	13'8	14'5	
	674'60	674'69		12734	1	350311	3	X	14'8	15'2	

TIME CONVERSION CHART
1PM – 13.0
2PM – 14.0
3PM – 15.0
4PM – 16.0
5PM – 17.0

REPORT OF MACHINE USAGE

Machine Type - 407

Mach. No.	Meter Readings Previous	Meter Readings Current	Hours of Usage
#1	1681.4	176.9	176.9 - (68.2 + 108.7 - See Note No. 1)
#2	8356.6	8603.0	246.4
#3	3077.4	3323.6	246.2
#4	297.7	334.4	36.7
#5	4562.0	795.6	217.6 - (171.2 + 46.4 - See Note No. 2)
#6	582.8	715.6	132.8
TOTAL USAGE			2639.2

NOTE: No. 1 - Last reading on #1 was 1749.6; meter was checked and re-set to 000.00 - last reading 108.7.

No. 2 - Last reading on #5 was 4733.2 before removal. New machine was installed and last reading was 46.4.

Figure 2

more than one machine he would sign in and out on all machines: i.e. on each machine which had its own meter and record sheet.

Each day at the beginning of the first operation the meter reading for that machine would be posted to the block provided (see upper right hand corner on sample sheet, **Figure 1**).

In a small or limited machine room operation, the actual machine usage for each machine could easily be determined on a daily basis by deducting the start-of-day meter reading from the last reading for the current day. The difference would be the actual usage and could be posted to a daily log book by machine type and accumulated on a weekly or monthly basis. In this manner the actual machine usage would be available for each type of machine **(Figure 2)**.

Reports showing 10 or 20 hours of actual usage during a month when 173 hours of rental were paid for are not uncommon.

Costs

Let us take for example a piece of equipment for which the base rental fee is $600.00 per month, plus the 10 percent tax. In a month in which the report showed a usage of 20 hours and allowing a factor of 25 percent of the usage for handling and set-up, we have a machine cost of $26.50 per hour.

$$20 + \frac{\$660.00}{(25\% \text{ of } 20)} = \frac{660.00}{25} = \$26.50$$

This points out how the machine cost per hour can be exorbitant when the actual usage hours are only a small part of the total rental hours paid for. Using the figures in the above example, there would be a potential of 118.0 hours of machine time available over and above the actual usage:

Potential	118 + (25% of 118) =	148 hours
Actual	20 + (25% of 20) =	25 hours
Rental hours paid for		173 hours

In a larger machine room it might be desirous to know the cost per job and/or the production efficiency of a machine group. It might well be advantageous to have the productivity of a given individual or a given type of machine to uncover bottlenecks and unaccountable building up of backlogs of work. All of this information is available by having the basic information which was recorded on the job record sheets key punched into cards and thus be available for processing to produce information formerly unavailable. In the event of requiring complete information for reporting as outlined above, set-up and handling allowances

Figure 3 INTERNAL TIME COMPUTATION

Job No	Opr. No.	Mach. Code	Clock No.	Date	Shft	Mach. Type	Set Up	Start	Stop	Ela-psed	Start	Stop	Ela-psed	Clock Exter	Meter Inter
859416	1A	4	A-39	9	1	407	#	70	76	.6	83460	83500	.40	.6	

Figure 4 ATTENDANCE SUMMARY

Department: Punched Card

Month: Section: Machine Room (407)

Name	Hours Paid Reg.	Hours Paid O. T.	Total Hours	Ill-ness	A. W. P.	Paid Holi-days	Training %	Training Hours	Vaca-tion	Total Paid Hours Not Available	Net Available Hours
A. A. Brown	160.0	8.0	168.0	8.0		8.0				16.0	152.0
	2240.0	138.0	2378.0	130.0	47.0	112.0		96.8	120.0	505.8	1872.2

should be established, and the amount of internal machine time must be reckoned with in computing the efficiency of an individual or group of operators.

Determining internal time

A suggested method to determine the amount of internal time, i.e. when more than one machine is being operated by an individual at the same time, is as follows. A control board would be wired so that:

The "start-clock time" is compared to the "stop-clock" time for the previous operation. In the event that the "start" time is equal to or greater than the "stop" time the difference between the "start" and "stop" time is determined and listed in a gross elapsed time column. In the event that the "start" is of less numerical value than the previous "stop" time the previous "stop" time is subtracted from the new "stop" time and the difference is printed in the "net" elapsed clock time column.

The gross elapsed meter time is compared to the "net" elapsed clock time and when the meter time is greater, the excess is printed to a column as "internal machine time" (**Figure 3**).

The elapsed time for both the "wall clock" readings and the "meter" readings would have to be punched into the cards before the above computation for internal time could be performed. This would be a machine operation.

The net available man hours, which are required to compute the operating efficiency, would be obtainable from attendance records, taking into consideration such deductible time as out sick, training, loaned or other non-machine time assignments (**Figure 4**).

The operating efficiency is determined by dividing the total machine hours (plus the handling and set-up) by the net available hours (**Figure 5**).

The actual operating cost of computer equipment cannot be over emphasized and usage controls should be established to determine realistic requirements.

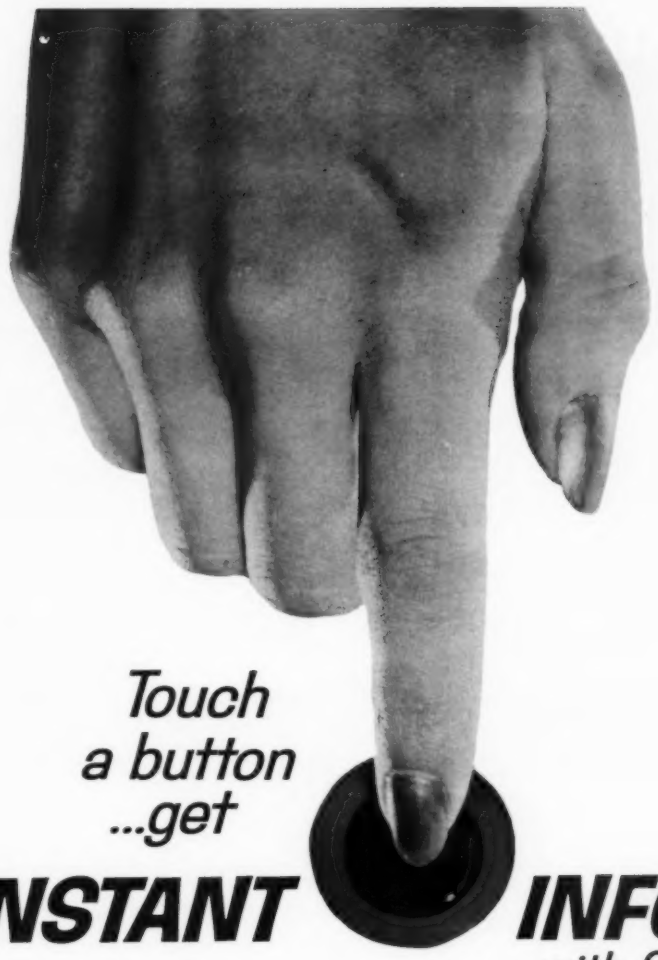
The sample worksheets and reports show possible operating information which would be available by the foregoing method. Several variations and other reports would be available by the collection of the suggested basic data. ■

Figure 5

Report For: 407's

Month Of:

1. Total Standard Hours	3080.4		
Internal Hours (Deduct)	417.4		
Adjusted Total	2663.0		
Board Wiring (Add)	8.8		
Net Std. Hours	2671.8		2671.8
2. Total Paid Hours			
Reg. Hrs. (Paid)	2240.0		
O. T. Hrs.	138.0		
Borrowed Hrs.	982.7		
Total	3360.7	3360.7	
Paid Hours Not Available			
Illness	130.0		
A. W. P.	47.0		
Holidays	112.0		
Training	96.8		
Vacation	120.0		
Loaned	204.5		
Man. & Cler. (999)	86.5		
Class Training	15.0		
Other			
Total (Deduct)	811.8	811.8	
3. Net Available Hours		2548.9	2548.9
Operating Percent (divide Item 1 by Item 3)			104.82%



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H 800 in Aerospace Facility

COMPUTER CENTER in Honeywell's new $5 million aerospace facility in Minneapolis is highlighted in this night photograph. At the right is the Honeywell 800 electronic data processing system, and at the left an array of 16 analog computers.

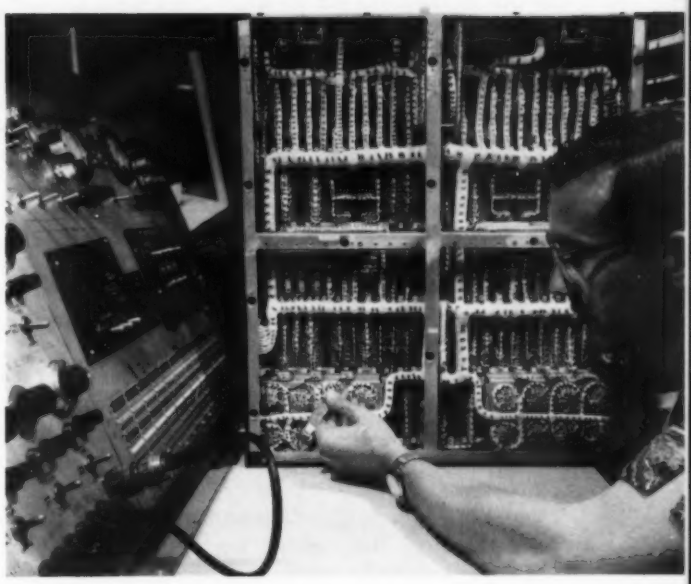
Minneapolis-Honeywell dedicates $5 million aero addition

COMPUTER CENTER at new aerospace facility consists of 16 analog computers (foreground) and the most powerful Honeywell 800 digital electronic data processing system built to date (background).

VISITORS WERE STARTLED and amused to hear excerpts of *Clarinet Polka, Stars and Stripes Forever, Nola,* and *Jinglebells* issuing from the Honeywell 800 computer at the data processing center at the dedication of the M-H Aero plant in early October.

Ordinarily the 800 is not a jukebox. In this instance it was programmed to sound like a woodwind for the diversion of the press, to lightly top off a day of touring the aerospace facilities and being briefed on the control and guidance systems for space vehicles at this Minneapolis plant.

The data processing center itself is overwhelming with its array of 16 Pace and Reac analog computers and large digital spread — the largest 800 yet built. The configuration includes 12 tape units, two tape control units, a central processor with three extra core memories which brings capacity to 16,384 words; there is a floating point option (which connects to the processor), high speed printer (900 words/minute), a 60,000 character a minute paper tape reader, plus a 650 card a minute reader and 100 card a minute punch.



NEW SPACECRAFT AUTOPILOT that "thinks for itself," scheduled to fly hypersonic X-15, gets a final check at Aeronautical division. The autopilot, called an adaptive flight control system, contains nearly 9,000 parts. Intricate wiring (background) is heart of the system. Unit at the left is a checkout console.

Honeywell believes this center is the first in the industry to combine use of analog-digital for scientific processing while simultaneously performing business data processing. This combination is possible through conversion of analog-to-digital and a real time control unit to transfer problems directly from one computer to another. The parallel processing abilities of the 800 allows it to handle business problems right along with the scientific. When the computer goes on two full shifts in January it is expected that two-thirds of the time will be taken by scientific and one-third by business problems.

The center will operate as a service for all plants of the Aero division, including the Minneapolis, St.

(continued on next page)

SATELLITE SIMULATOR at Honeywell's new aerospace facility is shown with the Project Mercury attitude stabilization and control system mounted on its surface. The entire simulator platform, weighing two tons, is supported on an air bearing that isolates it from the influences of friction and gravity to reproduce space-like conditions in the laboratory. It is so sensitive it will record the weight of a fly alighting atop.

Petersburg, and Los Angeles plants, plus scientific for the M-H Ordnance group.

The 117 members of the staff at the center will handle these functions for each of the five major departments of the division:

Research — Applied research problems, formula evaluation, simulation and technical information retrieval.

Engineering — Design, data reduction, project cost reporting, government reporting, proposals, and division catalog part and material usage.

Contract Management — Contract control, customer order summary, shipments to customer, sales statistics, and sales forecasts.

Factory — Quality analysis reports, vendor rating, production schedules, bill of material requirements, parts inventory analysis and orders, production accomplishment, and inventory dollar summaries.

Financial — Inventory accounting, financial reports, standard cost calculation and maintenance.

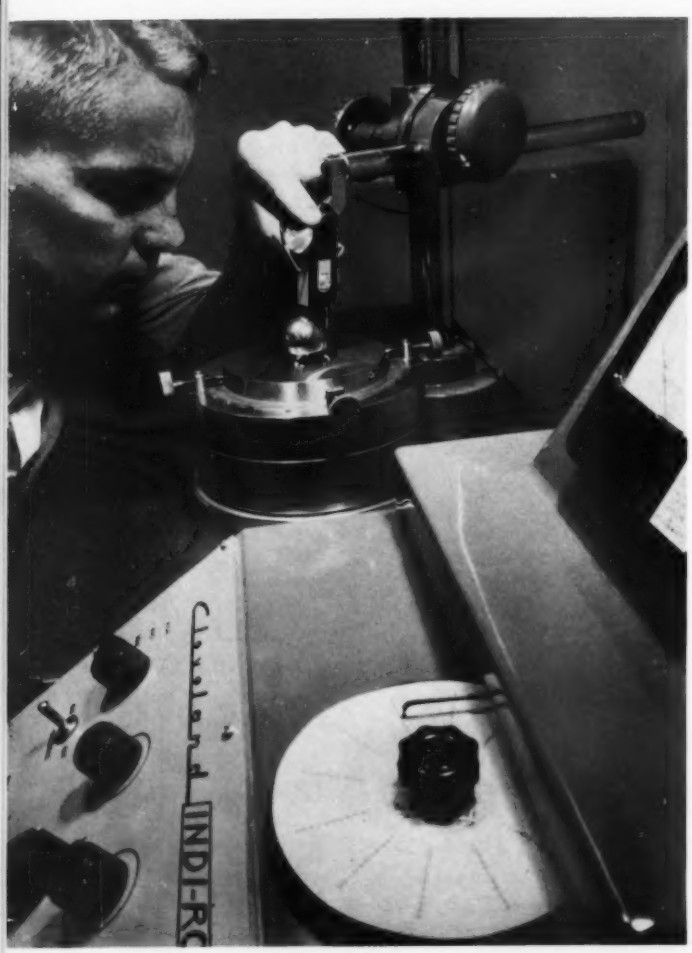
The 800 will daily schedule its own time by executive routine to meet all demands for its services. Previously the Datamatic 1000 had been used in the division. This was not capable of the scientific work. A three day workload of paperwork for the older and slower 1000 will be reduced to one day on the 800.

The space work of the Aero division has included participation with inertial guidance systems and reference systems in 44 out of the 54 successful space launchings to date. Aero is developing guidance and control equipment for the three manned space programs — X-15, Mercury, and Dyna Soar, and the inertial guidance system for Centaur and Saturn.

The autopilot (which had a successful test on the X-15 in late November) is an adaptive flight control system with the ability to sense conditions around the vehicle it controls and to automatically adapt the performance of the vehicle to meet these conditions. It is the first flight control system capable of blending aerodynamic and reaction controls at the critical time in manned space flight when the craft emerges from the atmosphere and reaction controls must take over.

The autopilot's core is a 92-pound miniature computer measuring 21 x 24 x 9 inches. It contains 90 complex electronic circuit cards with 8,771 parts. The circuits are dual redundant and failure of several entire circuits (unlikely) does not stop the function of the autopilot.

Another product at this plant is the company's electrically suspended gyroscope. This consists of a hollow beryllium sphere (whose accuracy is measured to a tenth of a millionth of an inch) suspended within a vacuum in a ceramic case and rotated at high speed. The ball replaces the earth as a reference point and promises improved gyroscope functions. ■



◀ SHINY BALL in this picture is the heart of Honeywell's new electrically suspended gyroscope said to promise greatly improved accuracy for space vehicle guidance systems. An electronic measuring device precise to a millionth of an inch is being used to check sphericity of the ball. The graph in the foreground records the measurements. The ball must be accurate to better than five-millionths of an inch.

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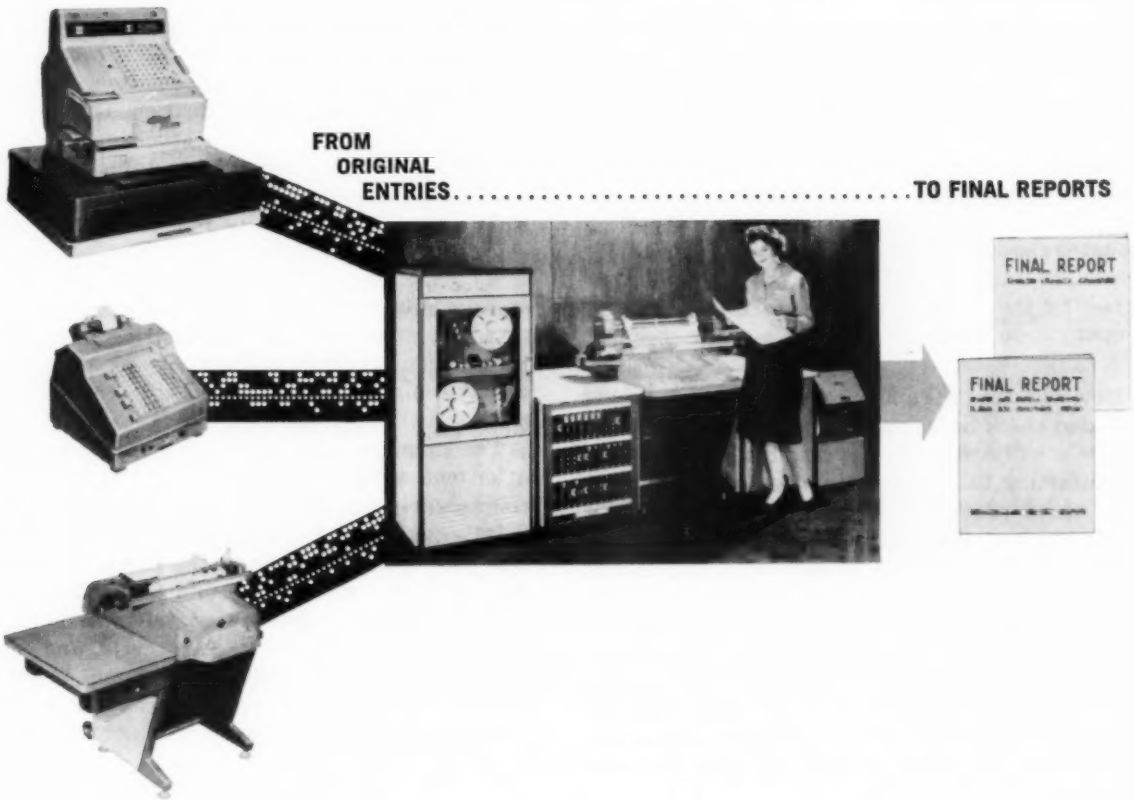

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Because of the nature of the mutual fund investment business, we have found it a great service to our investors to provide them with a book of 12 predated checks for ease of investing systematically a specified amount each month. These checks are signed by the investor and are forwarded to the company to be deposited each month on the specified date.

However, the time and expense involved in typing predated check books and handling and assembling this data by hand has warranted our consideration of converting to a machine application.

As there are always several approaches to a given problem, there can be several applications.

One application to this problem would have been to use the facilities of the IBM 305 RAMAC with the 408 on-line printer, which we have installed at FIF Management Corporation. This would have been what could be called a nuisance job, because of the frequency of processing, the short time required to complete the simple calculations involved and the greater length of time required to print the checks.

A second application could have been to punch cards for the 12 checks to be printed. Because of the nature of the job, this could require far more time, card usage, storage space and equipment, and file maintenance time than would have been profitable for machine application.

Method

Feeling that the following application might prove helpful to other types of businesses, such as investment, installment loan departments, insurance companies, etc., I will try to explain the procedure we adopted and the machine facilities used on an IBM 407 accounting machine to print these predated checks.

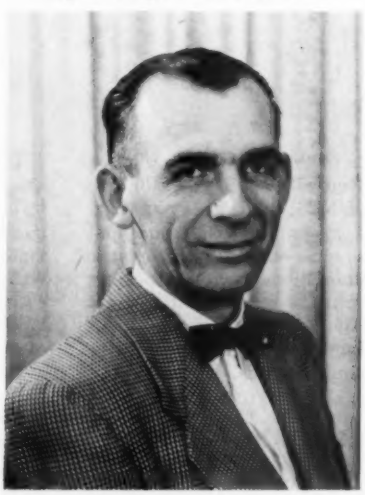
A 407 with 20 co-selectors, 20 pilot selectors, three digit selectors, and 20 counter groups was used. This specific application required the storing of all data to be printed on the check, consisting of 64 positions of alphabetic information, as well as 39 positions of numeric information. This information was punched into two cards and stored for printing in counters and storage units. All 64 positions of storage on the 407 were used to store the zones of the alphabet and 64 positions of counters were used to store the digits.

By using a half after one impulse to read out the storage units during the same machine cycle as the counters were read out, and wiring the counter exits to storage exits and out to transfer print, the alphabet digits were combined with the zones and correct printing resulted.

The counters were wired for direct reset at half after one time to eliminate the zeros from the counters meeting the zeros from the storage units.

Because 12 checks are printed with the information punched in two cards, the overflow program feature of the 407 is used and the fifth program level is wired to repeat. From the emitter, 13 was added into a counter on a card cycle, and one is subtracted on each program level one. When the counter reached zero, an impulse was available from the negative balance off hub and this impulse

By Daryl D. White



was used to pick a pilot selector immediately and by wiring an all cycles via balance test cycles to the common point of this pilot selector and out the transferred point to overflow end, the succession of program levels stopped when 12 checks were printed. This results in the machine feeding the next two cards and beginning the succession of overflow program steps all over again.

One of the major problems in this panel is the wiring of the month and year counters. The current month is read into a counter at card cycle time. On overflow program level two, one is added into the counter, thus bringing the quantity to the next month to be printed. The counter is read out on the following level one and compared against an emitted 12 for the month of December. If the comparing is equal, proper selection allows 11 to be subtracted in the month counter, thereby changing the month from December to January and the year to the next one following the current year.

Care must be taken in selection as the pilot selectors do not return to normal until the next card feed cycle. If a pilot is picked during the printing of the first check of a group of 12, it will remain transferred during the printing of the remaining 11 checks. Therefore, it is advantageous to use co-selectors for selection during the overflow program cycles. ■

Coming Events

DEC. 12 - 14
Eastern Joint Computer Conference, IRE, PGEC, AIEE and ACM.
Sheraton-Park Hotel, Washington, D. C.

DEC. 14 - 16
Forum on Legal Questions Raised by Computer Use in Business, Industry and Government.
Joint Committee on Continuing Education of the ALA & ABA.
Statler Hilton Hotel, Los Angeles, Calif.
Contact: John E. Mulder, Director Joint Committee, 133 S. 36th St., Phila. 4, Pa.

DEC. 27 - 30
American Statistical Association Annual Meeting.
Roosevelt Hotel, New York, N. Y.

1962

JAN. 10 - 12
AMA Workshop Seminar — The Personnel Department's Use of Data Processing.
American Management Center, Hotel Astor, New York, N. Y.

JAN. 15 - 17
Symposium of Optical Character Recognition.
Dept. of Interior Auditorium, C Street, Washington, D. C.
Contact: Miss Josephine Leno, Code 430A, Office of Naval Research, Washington 25, D. C.

JAN. 18 - 20
National Association of Accountants Meeting.
Subject: Reports to Management.
Conrad Hilton Hotel, Chicago, Ill.

JAN. 29 - 30
Financial Management Seminar. Sponsors: University of California, Berkeley, Federal Government Accountants Association, and Federal Business Association.
Union Building, University of California, Berkeley, Calif.
Contact: Lewis Nash, Univ. of Calif., Berkeley, Calif.

JAN. 31 - FEB. 2
AMA Clinics — Data Processing Conversion, EDP Computer Simulation, Data Systems Analysis for IDP, Operations Research, and Data Processing, and Data Processing Executive's Advanced Workshop.
AMA Management Center, Hotel Astor, New York, N. Y.

FEB. 6 - 7
Symposium on Redundancy Techniques for Computing Systems.
Dept. of Interior Auditorium, C Street, Washington, D. C.
Contact: Miss Josephine Leno, Code 430A, Office of Naval Research, Washington 25, D. C.

FEB. 7 - 9
Third Winter Convention on Military Electronics, IRE: PGMIL.
Ambassador Hotel, Los Angeles, Calif.
Contact: Wm. L. Johnson, c/o IRE Los Angeles Office, 1485 So. LaCienega, Los Angeles, Calif.

FEB. 12 - 20
American Bar Association Midyear Meeting.
Edgewater Beach Hotel, Chicago, Ill.

FEB. 12 - 14
AMA Worshop Seminar — The Personnel Department's Use of Data Processing.
Statler-Hilton Hotel, Dallas, Texas.

FEB. 14 - 16
International Solid State Circuits Conference.
Sheraton Hotel and Univ. of Pennsylvania, Philadelphia, Pa.
Contact: Richard B. Adler, Rm. C-237 MIT Lincoln Lab., Lexington, Mass.

FEB. 19
ADAPSO Management Symposium.
National Cash Register Center, Madison Ave., New York, N. Y.
Contact: W. H. Evans, Exec. Vice Pres. ADAPSO, 1000 Highland Ave., Abington, Pa.

FEB. 22 - 23
Business Forms Institute National Meeting.
Savoy-Hilton, New York, N. Y.
Contact: Alden E. Calkins, Public Relations Counsel, 350 Fifth Ave., New York, N. Y.

FEB. 26 - 28
AMA Clinics — DP Applications for Forecasting and Business Planning, Data Processing Controls and Audits, Data Systems: Production and Inventory Cycle, and Engineering Data Processing and Information Retrieval Systems.
AMA Management Center, Hotel Astor, New York, N. Y.

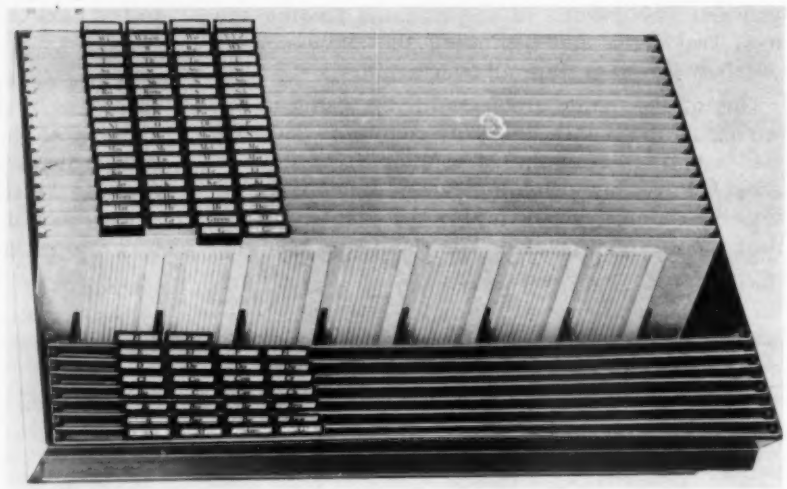
■

PRODUCTS AND SERVICES

VUE-FAX FILE

VUE-FAX System Controls Corporation manufactures a visible system to give immediate access to data provided by business machines. The DFC/VFC system, intended for use with all modern data processing equipment, comprises a series of cabinets that are individually designed to fit the special needs of many various office systems. Cards are stored in vertical position, accessible by opening top of cabinet. Storage capacity ranges from 10,000 cards per unit. Features include aluminum spacing panel for maximum capacity and to prevent sag, movable index tabs for full visibility, rayon velour base for additional stability at base of cards, and "card-out" control printed on face of index guide.

Circle no. 40 on reader service card.



SITE ENVIRONMENT SYSTEM

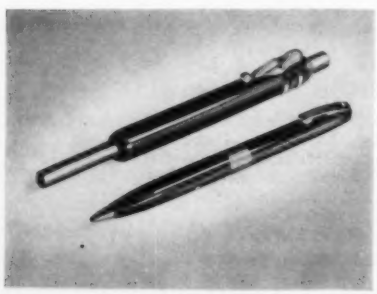
Floating Floor Inc. has announced the first step in a complete system concept with a Site Environment System within a unit. The unit, 31 inches wide by 72 inches long by 72 inches high, weighs 1,200 pounds. It offers air conditioning and floating floor to handle about 600 square feet of site.

Circle no. 41 on reader service card.

PWI WIRING TOOL

A new wiring tool for use in removing fixed wires from self-contacting control panels in data processing equipment has been developed by Panels Wires Inc. This tool enables quick removal of wires from panels without damaging or marring. The pen sized tool is 5½ inches long and priced at $2.75.

Circle no. 42 on reader service card.



SPRAY AIR CLEANER

Sprayit Division, Thomas Industries, offers an all purpose air cleaner, model 608, for appliance and business machine cleaning problems. The unit, weighing ten pounds, has a built in silencer and features a diaphram type compressor that never needs oiling. A seven foot flexible rubber hose has a thin nozzle that pinpoints the air jet to remove dirt. The unit is eight inches long, seven inches high and five inches wide.

Circle no. 43 on reader service card.

DRESSER TAPE-FILE

Dresser Products is offering a heavy duty, manual tape winder, taking seven and nine inch removable face reels, which operates on a four-to-one ratio that makes it possible to wind tapes at high speed. Special orders are taken for 12 inch reels for use with this winder, #5061 Tape-File.

Circle no. 44 on reader service card.

INDEX FOLDERS

New Art Metal "Fan-Folders" are designed for indexing by data processing machines and used in standard filing cabinets. First of a series of products designed to integrate conventional paperwork procedures to data processing, the new folders eliminate typing, label pasting, and cost of labels.

Circle no. 45 on reader service card.

1401 OVERLAP SYSTEM

IBM announced optional circuitry which will increase the job speeds of the 1401 computer by as much as 20 percent. This is possible by a new processing overlap feature which enables the computer to perform simultaneously with a wide range of input-output functions, thus reducing processing delays. Although processing still must be interrupted for the actual data transfer, computing can now overlap much of the remainder of the input-output cycle.

Throughput of the 1401 is increased by overlapping other functions with processing: tape read/write on 7330 magnetic tape unit in both high and low density; tape read/write on 729 unit in low density; card read and/or punch on the 1402.

The new overlap feature will be available in the first quarter of 1962; it will rent for $250 a month or sell for $15,000.

Circle no. 46 on reader service card.

MESSAGE DISTRIBUTION SYSTEM

Minneapolis-Honeywell's semi-automatic Teletypewriter Message Distribution System was developed to eliminate a bottleneck in the U. S. Army Signal Corps. It resembles a large digital computer and acts as an automatic sort-and-process on incoming teletype messages. The elec-

tronic memory remembers messages coming in and routes them according to time of arrival and priority classification, handling as many as 105 receiving teletypes. Priority interrupt suspends less important messages which are remembered and sent later.

The system consists of 40 cabinets of electronic circuitry and storage, a control console, five record page printers and 105 terminal teletypewriters.

Memory consists of magnetic drum and magnetic tape units. Messages can be located and retrieved in minutes, time of receipt of every message is automatically recorded, and messages can be filed for record purpose on magnetic tape.

Circle no. 47 on reader service card.

PROJECT PLANNING PROGRAMS

Bendix Computer division has devised a simple and practical approach to project planning, similar to the Navy's PERT and the Air Force's PEP. Developed for the G-15 computer, it permits automatic planning, scheduling, estimating and control of engineering, construction and development projects.

Computer assistance for the control and coordination of multi-factored projects is drawing increased interest by business and industry for commercial projects.

Input to the computer includes individual jobs and the estimated time required to complete each job. Output is in chart form. The method allows random numbering of jobs, with no editing or sorting required of the computer. Changes and additions can be made after the original program has been entered into the computer. The Bendix system allows jobs to be numbered in any order, with a single requirement that the last even be given the highest number. The computer does no editing.

Circle no. 48 on reader service card.

DATA CRUISER

Benson-Lehner has developed a new demonstration laboratory on wheels which takes equipment to the customer's doorstep. The Data Cruiser is a truck-trailer with data processing equipment and a conference room. The units aboard include a magnetic tape converter, an electro-plotter and an Oscillograph Analyzer Recorder, as well as a variety of high speed photo instruments and a correlation system for instrumentation cameras. Demonstrations are by appointment.

Circle no. 49 on reader service card.

TAPE-MINDER

Universal Tape-Minders have announced the new 110 character per second 100-HH which coordinates with the Teletype CX Reader and BRPE Punch units. The Minder is designed to work at 11 inches per second on two inch diameter core. By using a four inch diameter tape clip on reel, speed can be increased to 22 inches per second. The Minder automatically handles data in unattended and off hours situations.

Circle no. 50 on reader service card.

RECORD-A-MATIC

American Data Machines announce a compact printing and punching attendance recorder, Record-A-Matic, which produces a single document containing all required data for each employee (both printed and punched form) for a weekly payroll.

The records are on pre-printed time cards, kept in the "in" rack adjacent to the unit, which are inserted into a card-feed at the top and automatically fed to an inner

in performance!

Single-piece construction of VPC Manual Plug wire completely eliminates tip or terminal breakage . . . cannot fall apart shorting machine. Two-way captive spring permits easy pull-out (exceeds IBM push-out requirements) yet provides strong-set lock. Nickel-plated Plug wire tip applied with patented "F" (bare wire) crimp prevents corrosion, assures maximum electrical performance. Millions in use.

VPC maintains complete inventory of all types wires for IBM Data Processing equipment. Immediate shipment.

VIRGINIA PANEL CORPORATION
WAYNESBORO, VIRGINIA

Wherever there's an IBM installation there's a VPC Representative nearby.

Manufacturing Plant located within overnight delivery via normal overland transportation of over 60% of IBM installations in the United States.

VPC

VIRGINIA PANEL CORPORATION
Dept. DP • Waynesboro, Virginia
Yes, please send me complete details on outstanding features of VPC Panels, Covers and Wires

NAME_____
COMPANY_____
ADDRESS_____
CITY_____ ZONE_____ STATE_____

Circle no. 15 on reader service card.

unit for printing and punching, then returned to top of the unit for extraction.

The output is a visual code punched card which is direct input to any data processing system. The unit will punch, on a daily basis, three columns for "in" and three columns for "out" time—for a seven day week. Time is punched on a 24 hour basis with minutes divided into tenths.

A manual handle determines in-and-out printing and punching. A microswitch detects the cropped portion of the leading edge of the card to prevent cards from being reversed. The unit is 28 inches high, 16 inches wide, and 11 inches deep.

Circle no. 51 on reader service card.

CRIMPING KIT

A new kit for converting obsolete jack-type control panel wires to the self-contacting type is available from Tech Panel Co., Inc., at a cost of $22. The kit consists of a specially-designed crimping tool and 1,000 wire-tip sleeves. Purchased separately, the crimping tool sells for $10 1,000 wire-tip sleeves cost $15.

Circle no. 52 on reader service card.

UNIVAC'S UNICALL

Remington Rand Univac introduced their Unicall in October. This is a simple alphanumeric computer input/output device, used with Dataphone 401, for remote input/output to any Real Time System.

Complete messages of up to 40 alphanumeric digits can be transmitted over Unicall over long distance telephone lines from any point in the United States in about two seconds. Voice reply transmission, from magnetic drums at the computer site, begins within half a second of receipt of the inquiry.

It is particularly adapted to problems encountered in the airline, hotel, auto rental, stock brokerage, credit reference, chain store retailing, and aircraft manufacturing industries, where fast reservations and references are necessary.

The set is small, 18 x 12 x 9 inches, and can be set on desk or counter.

Monthly rental for a Unicall set is about $30.00; sale price is tentatively $1,350.

Circle no. 53 on reader service card.

MEDIA

The Magnavox Company has developed the MEDIA System (Magnavox Electronic Data Image Apparatus), a system of information storage and retrieval.

This is a photographic i.f. system using the unit record concept. The unit of storage is a small photographic film card, 16mm by 32mm; the prime information field will be two 9 x 14 inch information pages reduced 30 times. The secondary information field contains up to 17 digits of encoded and visually readable numbers which identify the graphic information on the card.

The file of cards combines manual and machine operations. In-filing is a manual operation, search is a combination of manual and machine.

The Media flow system begins with the camera coder which photographs documents and codes them. The microfilm is processed and duplicated for safety storage. The microfilm is cut to size and filed in capsules which are stored in Media cabinets. When desired for use, the selector-reproducer can automatically retrieve documents from these capsules and reproduce full size black and white copy.

Circle no. 54 on reader service card.

■ ■ ■

DeParis

(continued from page 36)

ject program. Prior to this phase, source instructions have been converted to intermediate symbolic statements, each of which will assemble into one machine instruction. To write instructions for an assembly program, the coder must know machine features, how the operation codes manipulate data, and must program accordingly.

A *compiler* is a program which will generate more than one machine instruction for one source instruction written in the compiler language. Cobol is an example of a compiler source language. A compiler source language is more remote from machine language than an assembly program source language. Hence, a compiler is more complex, requires more time for translation, and goes through more than an assembly program does in generating an object program. A processor goes through the compiling phase (translation to symbolics) first and then through the assembly phase in the development of the object program.

Macro instructions

Macro instructions, mentioned earlier, are a powerful part of a compiler source program. Essentially macros are one line statements which describe a series of actions to be carried out by the object program. For example, add A to B and store result in C would be one macro instruction which would generate several instructions in the object program.

How are macros analyzed to develop the several instructions involved? An integral function of a compiler is to recognize and segregate macro statements. These statements go through the macro generation phase of the compiling routine wherein a library of macro subroutines generate the individual symbolic instructions called for by each macro instruction. These symbolic instructions are then assembled to machine language.

The development from machine language programming to symbolics and thence to problem oriented languages like Cobol has been evolutionary. Because of this evolution, these language levels have pyramided one on the other. This can be gleaned from the fact that the translation routine involves going from the source language into symbolic language and then from the symbolics into the machine code of the object program.

In the future it is only reasonable to expect that all processors will translate the source program directly into machine code without the need for the intermediate symbolic language. ■

PEOPLE AND PLACES

Two appointments were announced at AUERBACH ELECTRONICS CORPORATION: *Lawrence A. Feidelman* to the Systems Engineering Group and *Joseph Reymann, Jr.* to Technical Staff.

Herbert F. Mauner has joined the management staff of AUTONETICS' INDUSTRIAL PRODUCTS as long range product planning manager for non-military markets. *Robert Dee* has been named as sales manager, Computing Equipment, to direct marketing for the Recomp II and III equipment.

BALTIMORE BUSINESS FORMS, INC. announced *Charles D. Wood* and *Paul O. Wilson* as vice presidents for the finance and administration division and manufacturing divisions respectively.

BENDIX CORPORATION has announced appointment of *James E. Harrison* as marketing manager of the semiconductor division and *Ron Breitmeyer* as senior systems analyst - market analysis, computer division.

Robert C. Fischer has assumed the position of data processing sales technical manager for BURROUGHS CORPORATION'S Detroit district.

Richard L. Waddell has been named director of public relations for the BUSINESS EQUIPMENT MANUFACTURERS ASSOCIATION.

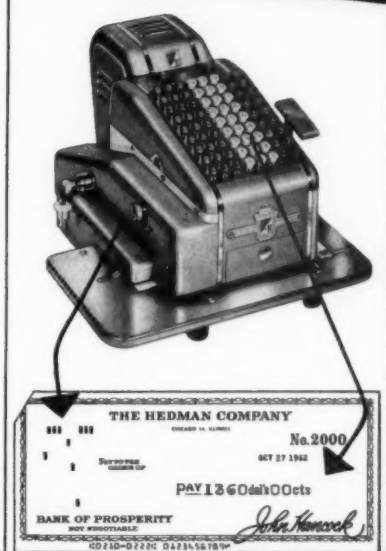
C-E-I-R, Inc. has *Elizabeth Strachan Freret* as their new tax counsel, assistant general counsel and assistant secretary of the corporation. *William C. Clauer* has been appointed director of a newly-formed Business Data Processing Division, New York City. *Dr. Emanuel Singer* was named director of technical services of the Houston Center.

COLLINS RADIO COMPANY (Dallas) has named *M. L. Doelz* vice president and general manager of the company's Information Science Center, Newport Beach, Calif.

CONTROL DATA CORPORATION announced the opening of their new Computer Division office in Houston, Texas with *Clifford M. Keddie, Jr.* as district sales manager. *Wilbur A. Serwat* will direct sales in a five state area from a new district office in Oak Park, Ill.

DATAPULSE INCORPORATED has named the following as sales representatives: *George Gostenhofer & Associates Inc.*, in Waltham (Mass.) and Cheshire (Conn.); *G. Curtice Engel & Associates Inc.*, New Jersey, New York, Pennsylvania, Maryland and Washington, D.C.; *LeeMark Associates, Inc.*, Kansas City and St. Louis, Missouri; *Hytronic Measurements, Inc.* in Denver, Albuquerque and Salt Lake City; *John Francis O'Halloran & Associates* in California and direct service to Phoenix and Tucson, Ariz.

Now— A CHECK PROTECTOR WITH A BUILT-IN KEY PUNCH



F&E KEYPUNCH PROTECTOR

The Real Answer to Complete Account Reconcilement without Manual Key Punching

- No Key Punch Errors
- Source input-subsequent amount key punching eliminated
- Automatic-protected and punched amounts are simultaneous
- Standard IBM Code

Royal Companion Check Signing and Dating Machine Attachment Available

FOR — PUNCH CARD CHECKS • MONEY ORDERS • GIFT CERTIFICATES TIME PAYMENT RECEIPTS • INSURANCE CLAIM CHECKS, ETC.

THE HEDMAN COMPANY
1158 West Armitage Avenue
Chicago 14, Illinois

SINCE F&E 1914

DATA PROCESSING DIVISION

MAIL COUPON DP 12-61

THE HEDMAN COMPANY
1158 W. Armitage Ave., Chicago 14, Ill.
Please send information on your Keypunch Protector

NAME.....
FIRM.....
ADDRESS.....
CITY.....STATE.....

Circle no. 19 on reader service card.

By Robert W. Parsons

Installation Management by Exception

A way to avoid spending excessive time in record keeping

TO EXPLAIN BRIEFLY the title of this article, the term "management by exception" is taken from computer firms whose systems men have thus labelled this type of management reporting which highlights only the trouble spots, or exceptions. The word "installation" has been added because our intent is to point out a system of utilization which can be used in varying degrees, to highlight the trouble spots within the installation.

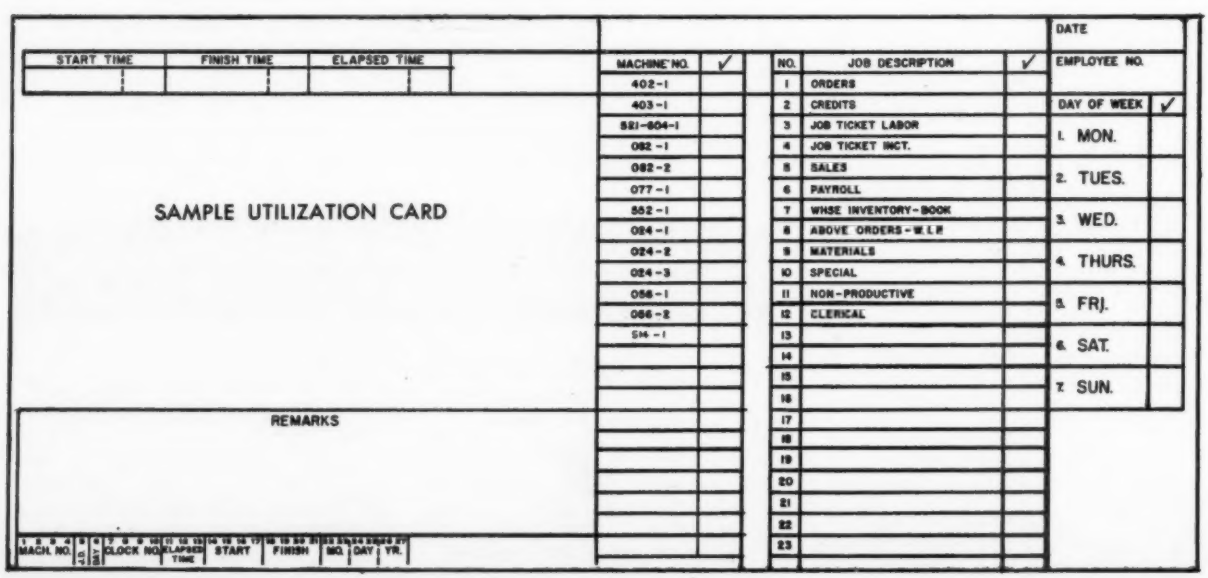
The major purpose of record keeping of utilization within the data processing installation are, we believe:

1. To serve as a record of past experiences, to be considered as factors when making decisions.
2. To prove to superiors that the installation is in an efficient operating condition.
3. To emphasize an area of improvement or need for improvement and to show the effects of problem solutions.

Several years ago, a manager of a large installation told an amazing tale. This man claimed to have spent three weeks of every month in recording and analyzing utilization within his installation. Very expensive record keeping, but apparently he deemed this work necessary because of the work load. He had to know when the usage of a machine was creeping to 85 percent, and his utilization records were used to bolster his recommendations. You will agree that, whether our needs are small or large, good utilization records are helpful to every manager, but the system should be short and economical.

The system we have recently incorporated in our installation is both short and economical, as well as simplified. As can be seen from the sample utilization card pictured, we have tried to put all machines and all procedures on the card so that the blocks to the right need only to be checked. The advantages to this type of card are many:

1. Easy to fill out.
2. Information can be gained at a glance.
3. Records can be summarized:
   a. By employee number
   b. By machine type
   c. By type of procedure
   d. By day of the week.
4. Additional features can be incorporated on the card as needed, with room to add new functions and new machines.



5. These utilization records can be handled either as a machine function or manual function, depending on the time element or volume.

Posting and analysis

From the completed card, elapsed time totals can be posted to report No. 1 — employee utilization amounts — by clock number, on either a daily or weekly basis. Analysis of this report would mainly indicate the employees not filling out cards and in some cases, the progress of an employee.

Elapsed time can then be posted either daily or weekly to report No. 2 — machine utilization — to show subnormal and abnormal machine time for each machine, and also a percentage to indicate the progress of the installation.

Elapsed time would then be used for report No. 3 — procedure utilization and employee efficiency — in the same manner as previously stated. This summary can be very informative if:

1. This summary is checked to a time summary of standards for each of the major procedures for variances.
2. The clerical time spent is checked to see if it is out of line. Our own yardstick is that clerical time will be approximately 20 percent or 25 percent of the total machine time.
3. The non-productive hours are analyzed to confirm whether employee efficiency is within the limits of feasibility.

Most of the utilization information we desire to obtain is complete, with the possible exception of an analysis by the day of the week. By this we mean, a comparison of the days of each week of a period, to pinpoint our peak days. Once we realize them, we can reschedule work loads as the opportunity presents itself, which results in a more even distribution of the work load.

From the reports mentioned, charts can be drawn of the progress made in certain directions, and also of any critical areas. These charts are useful in graphic presentations to management.

This procedure is not wholly foolproof since employees could distort the utilization picture by using a quick pencil to cover any number of functions of which they do not want their supervisors to know. This situation can only be overcome by using a watchful eye, and possibly, by reassurance to employees that results will be treated in a reasonable manner.

On the other hand, this method is flexible, and has proved to be more accurate than other means previously tried. It enables us to create a helpful, graphic study in the areas that are either critical, or, because of their nature, tend to draw undue criticism.

(continued on next page)

Manual Report #1

Employee 1961

	Date Week Ending	Supervisor	Assistant Supervisor #205	#26	#17	#43	#29	
1	1/7/61	100	181	561	442	400	396	1
2	1/14/61		193	579	421	400	320	2
3	1/21/61		161	542	462	400	320	3
4	1/28/61		142	521	413	396	400	4

Manual Report #1

Utilization Amounts

	#8	#25	#36	#42		Total Weekly Hours	
1	400	400	400	400		3680	1
2	400	400	400	400		3513	2
3	400	400	400	400		3485	3
4	400	400	400	400		3472	4

Manual Report #2

1961 Machine

	Date Week Ending	402-1	403-1	① 521-604-1	② 082-1	③ 082-2	④ 077-1	⑤ 552-1	⑥ 024-1	
1	1/7/61	114	245	163	161	90	100	61	381	1
2	/14/61	50	207	175	141	131	99	52	395	2
3	/21/61	101	207	133	128	122	86	58	391	3
4	/28/61	138	239	129	122	121	81	55	374	4

Manual Report #2

Utilization

Note: Total machine hours — maximum possible machine hours = % utilization

	024-2	024-3 on (order)	① 056-1	② 056-2	③ 514-1	④ Total Machine Hours	⑤ Max. Poss. Machine Hours	⑥ % Utilization	
1	395	—	386	395	261	2752	4800	573	1
2	392	—	389	394	243	2668	4800	556	2
3	391	—	391	391	255	2654	4800	553	3
4	387	—	389	382	246	2663	4800	555	4

Manual Report #3

Procedure Utilization

	Date Week Ending	Orders	① Credits	② Job Ticket Labor	③ Job Ticket Incentive	④ Sales	⑤ Payroll	⑥ Whse Inv. - Book	
1	1/7/61	846	447	645	109	199	189	161	1
2	/14/61	855	436	667	108	195	186	82	2
3	/21/61	869	422	689	101	176	183	73	3
4	/28/61	831	385	654	105	187	187	151	4

Manual Report #3

and Employee Efficiency

Note: Total productive hours ÷ total hours = % of employee efficiency

	Above Materials W. I. P.	Orders	① Special	② Clerical	③ Total Productive Hours	④ Non-Productive Hours	⑤ Total Hours	⑥ % of Employee Efficiency	
1	—	136	20	878	3630	50	3680	986	1
2	—	129	10	805	3473	40	3513	988	2
3	—	111	30	786	3440	45	3485	988	3
4	—	123	40	768	3431	41	3472	988	4

DATA . . . yours for the asking

MARKET STATISTICS, Inc. issued a new brochure, *Bringing the Census Up to Date*, which describes the role of the business economist in today's industry, demonstrates how computers are used to aid business, and offers ideas on how to utilize buying power statistics.

Circle no. 70 on reader service card.

MINNESOTA MINING & MANUFACTURING Company has three illustrated booklets describing the use of microfilm in the Federal government. These cover the role of microfilm at the Social Security Administration, the U. S. Bureau of Public Debt, and the U. S. Army Finance Center.

Circle no. 71 on reader service card.

PACIFIC STATES ENGINEERING is offering an eight page brochure describing its services in the design of devices to improve efficiency in office, factory, and laboratory. The company's specialty is the application of space age technology in the development of commercial products.

Circle no. 72 on reader service card.

RAYTHEON'S MICROWAVE & POWER TUBE division has a new 70 page microwave tube catalog listing 201 active, unclassified microwave tubes of all types, ferrite devices, magnetic components, high power test modulators, and infra-red detectors.

Circle no. 73 on reader service card.

ANKEN CHEMICAL & FILM Corporation's company periodical has a two page case history report on photocopying techniques in simplifying billing procedures. This system photocopies charge account entries for monthly invoices and statements in retailing, professions, and a variety of service operations.

Circle no. 74 on reader service card.

BATTELLE MEMORIAL INSTITUTE is offering a booklet discussing *"Can the Research Scientist Acquire a Management Attitude?"* to representatives of industry concerned with research and development.

Circle no. 75 on reader service card.

PHILCO Corporation explains *Sort Operations*, emphasizing the speed and capacity of the 2000 systems.

Circle no. 76 on reader service card.

COMPUTER CONTROL Company's new catalog on *Dicotron* contains eight pages of specifications and technical description of linear and sine-cosine precision optical encoders for converting angular position information into binary code. Also included are encoder principles of operation, applications, packaging features and relationship between disk coding and degree of accuracy.

Circle no. 77 on reader service card.

CHARLES BRUNING COMPANY has published a 16-page booklet entitled *"Time Saver for Tax Accountants."* Containing the latest ideas for work and reduction and preparation of tax returns and schedules, the booklet is geared to speeding tax work.

Circle no. 78 on reader service card.

COMPTON CHART PRODUCTIONS has written a bulletin describing a new "Target" method of graphically presenting goal-directed data, suitable for plotting sales performances, production quotas, financial figures and other quantitative data.

Circle no. 79 on reader service card.

DOCUMAT, INC., has issued a brief description of its new "Mark II" Reader-Printer.

Circle no. 80 on reader service card.

STRATO-FLOOR, INC. will supply interested persons with a four-page pamphlet dealing with Strato-Floor, a new type of elevated flooring designed particularly for use in electronic computer installations, or wherever extensive cabling and wiring systems require under-the-floor space and immediate accessibility.

Circle no. 81 on reader service card.

Now Available
Programming Training Courses

IBM
1401
DATA PROCESSING
SYSTEM
Course 102
PROGRAMMING FOR
BUSINESS COMPUTERS
Course 101

Prepare now for the new generation of Accounting Machines

Write For Free Information

BUSINESS ELECTRONICS Inc.
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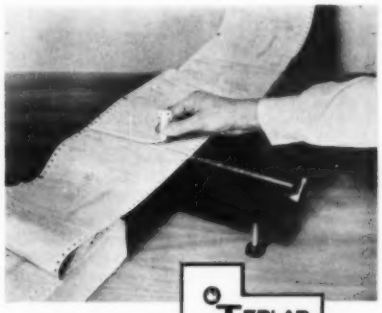
PROGRAMMING SECTION
420 MARKET STREET
SAN FRANCISCO, CALIF.

Over 5 years experience in Programming Training
Accredited Member National Home Study Council
Circle no. 16 on reader service card.



"THERE'S NO END WITH" THE TEDLAR JOINER

This precision instrument eliminates wasteful short strips of forms! Speeds up production!

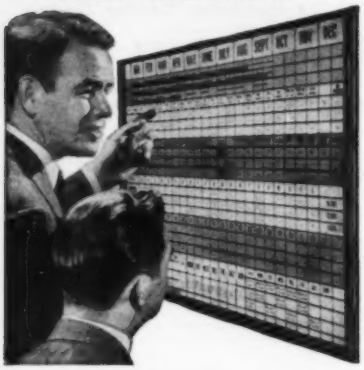
Ever-increasing usage by leading concerns is proof of the economy and efficiency of the TEDLAR JOINER. Provides uninterrupted feeding of forms on tab and high-speed printers. Reduces "down time". Utilizes left-over strips of forms by joining them together into a continuous feeding stream.

At Your Supplier or Write for Descriptive Literature and Prices

THE TEDLAR COMPANY
P.O. BOX 27 HUNTINGTON, NEW YORK

Circle no. 17 on reader service card.

How To Get Things Done Better and Faster



BOARDMASTER VISUAL CONTROL

★ Gives Graphic Picture—Saves Time, Saves Money, Prevents Errors
★ Simple to operate—Type or Write on Cards, Snap in Grooves
★ Ideal for Production, Traffic, Inventory Scheduling, Sales, Etc.
★ Made of Metal. Compact and Attractive. Over 500,000 in Use

Full price $49.50 with cards

FREE 24-PAGE BOOKLET NO. KV-10 Without Obligation

Write for Your Copy Today

GRAPHIC SYSTEMS

YANCEYVILLE, NORTH CAROLINA

Circle no. 20 on reader service card.

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EQUIPMENT ENCYCLOPEDIA UPDATING SUPPLEMENT READY

THE FIRST QUARTERLY SUPPLEMENT to the DATA PROCESSING EQUIPMENT ENCYCLOPEDIA will be distributed this month to subscribers to this service. Two supplements have been prepared. One updates information which was published in the first edition of Volume One of the Encyclopedia, dealing with punched card, punched tape, and other electromechanical equipment. The other supplement updates Volume Two, which describes 107 digital electronic computers, seven MICR devices and five optical scanners.

The first set of supplements features specification changes, revised price comparison charts, and physical characteristics tables, as well as new system schematics reflecting changes in computer configurations. New equipment entries are in preparation for publication in the second set of supplements, for release March 15.

The quarterly updating service represents a continuation of the extensive research and editorial effort which produced the EQUIPMENT ENCYCLOPEDIA — the first and only comprehensive source of published information, in standardized format, about the entire range of available data processing equipment. The resources of American Data Processing, Inc., (formerly Gille Associates, Inc.) pioneer publishers to the data processing field, have been tapped in depth to make the EQUIPMENT ENCYCLOPEDIA and its supplements the most thorough and reliable data processing equipment reference source in existence.

The price for each volume (with updating supplements) is $45. Updating alone (for those who already have the basic volumes) is $20 each volume.

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BOOK SHELF

MANAGEMENT INFLUENCE ON THE DESIGN OF DATA PROCESSING SYSTEMS by Edward L. Wallace. Harvard Business School, Division of Research, Cambridge, Mass. 1961. 259 pages. $3.00.

This is a case study describing the efforts of a shoe manufacturing company to design an automatic data processing system to reduce clerical work and provide better production and inventory control. Emphasized are the company's problems of planning and how this led to the design and redesign of the system. As the company's study progressed it became apparent that company personnel had shifted emphasis of the study away from the initial problem of effecting improvements in operations planning and toward mechanization of existing data processing procedures.

An attempt is made to analyze the effects of each decision upon results expected from the new data processing system.

The study is in five parts: the introduction, description of the company and its planning methods, a previous attempt by the company to mechanize its data processing which failed because of lack of cooperation, planning, and inadequate equipment — this previous attempt influences the second try at automatic data processing. The book continues with a description of the system now planned, methods employed in planning and expected results, which is followed by a critique of the company's plan.

The author is Professor of Accounting and Business Administration at the University of Buffalo, formerly at Harvard Business School and the University of Chicago. ■

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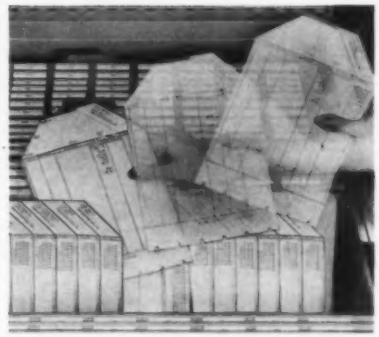

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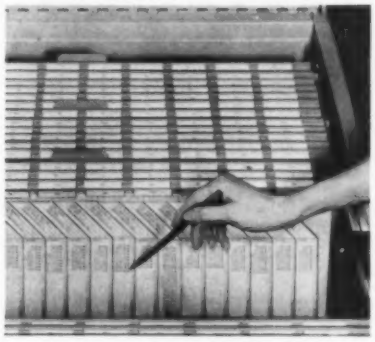

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editorial

WITH THE CONTINUED RAPID EXPANSION of American enterprise in the European Common Market, the problems of international unification of computers and other electronic machines become acute. The identified areas of a modern data processing system can all be blended into an integral nerve system from which maximum service to the user can be derived. Techniques and the equipment performing these more efficient methods are in existence but their potential cannot be realized without utilizing them.

The many remote points of data origin can be furnished an electronic path over which to deliver the raw data. The centers are capable of processing the raw data even if it is presented in a variety of media, the deserving end-products of the processors can be transmitted to the remote user. All of this is in operation today on a national scale and can equally exist on an international scale for the business world. Already certain military processing systems have shown the way.

The road to successful world-wide data communications does not have to depend on some future scientific breakthrough; if we have been awaiting this, it is a false excuse on which to base failure to progress. Future developments such as space-satellite communications relays will provide more of the wires we will need. However, in the interim the tools we need are at hand and we need only break down barriers to their use. These barriers are man-made and unrealistic, they are not technical. It is break-down of traditional barriers, not technical break-through, that is needed. The result will be the adequacy of the data communications sought by progressive business organizations for their data processing activities. ■

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